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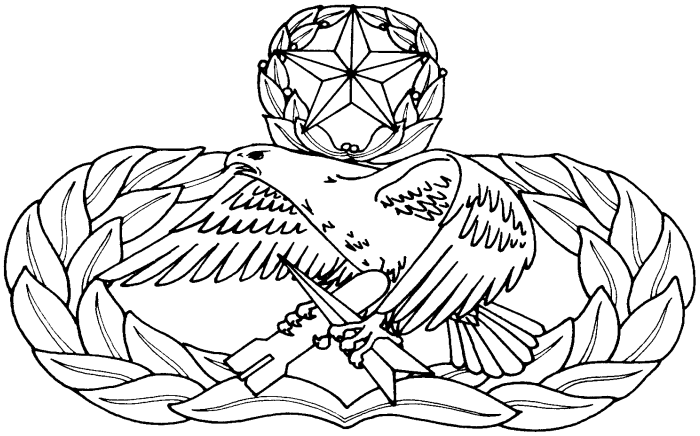
SATELLITE, WIDEBAND AND TELEMETRY SYSTEMS



CAREER FIELD EDUCATION AND TRAINING PLAN

SATELLITE, WIDEBAND AND TELEMETRY SYSTEMS
AFSC 2E1X1
CAREER FIELD EDUCATION AND TRAINING PLAN

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Part II

SATELLITE, WIDEBAND AND TELEMETRY SYSTEMS
AFSC 2E1X1
CAREER FIELD EDUCATION AND TRAINING PLAN

PART I

Preface

1. Resource constraints in the Air Force are impacting the availability of our most valuable resource - manpower. This condition, which will continue to exist in the future, makes it essential for the work force to be effectively and efficiently trained to perform duties within each skill level of an Air Force Specialty (AFS). In order for the Air Force to meet the challenges of tomorrow, a greater emphasis must be placed on career field training. This Satellite, Wideband and Telemetry Systems Career Field Education and Training Plan (CFETP) is a management tool that will enable the Air Force and each MAJCOM to place the needed emphasis on total career field training. It provides the framework and guidance necessary to plan and develop a career field training program. The plan, which is a "training road map" for the career field, identifies mandatory and optional training requirements. It includes initial skills, upgrade, and continuation training that individuals should receive during their career in this specialty.

2. The CFETP, which documents the career field training program, consists of two parts. Management uses both parts to plan, manage, and control training within the career field.

2.1. Part I, Section A provides the information necessary for overall management of training in the career field. It contains administrative details and explains the purpose and use of the CFETP. Section B provides a description of the specialty, suggests career field progression, provides career field information, documents training decisions, defines each skill level, and identifies MAJCOM continuation training options. Section C specifies qualification requirements for upgrade/progression in each subsequent skill level in the career field and provides a complete list of continuation training for the specialty. Sources of training, other than those provided by AETC, are also identified. Section D identifies known resource constraints.

2.2. Part II of the CFETP contains the Specialty Training Standard (STS) and identifies the various training sources and courses available to members of the specialty. The STS is comprised of the Course Training Standard (CTS) and the Career Training Guide (CTG). The CTS includes the tasks and knowledge requirements for award of the three skill level. The CTG includes the tasks and knowledge requirements for upgrade/progression in each subsequent skill level in the career field and identifies proficiency levels achieved in initial skills training and the Career Development Course (CDC). Supervisors and trainers, at the unit level, use Part I, Section C and Part II of the CFETP to identify, plan, and conduct unit level training commensurate with the overall goals of this plan.

3. Use of the guidance provided in this CFETP will ensure individuals in this career field receive effective and efficient training at the appropriate points in their career. This plan will enable the Air Force to train today's work force for tomorrow's jobs.

Abbreviations/Terms Explained

Provides a common understanding of the terms that apply to the Satellite, Wideband and Telemetry Systems Career Field and Education Training Plan. Terms:

Advanced Training. A formal course of training that leads to a technical or supervisory level of an Air Force Specialty (AFS). Training is for selected airmen at the advanced level of an AFS.

Air Force Job Qualification Standard (AFJQS). A comprehensive task list that describes a particular job type or duty position. Supervisors use the AFJQS to document task qualification. The tasks on AFJQSs are common to all persons serving in the described duty position.

Air Force Qualification Training Package (AFQTP). An instructional course designed for use at the unit to qualify, or aid qualification, in a duty position or program, or on a piece of equipment. It may be printed, computer-based, or other audiovisual media.

Career Field Education and Training Plan (CFETP). A comprehensive, multipurpose document, that encapsulates the entire spectrum of career field training. It outlines a logical growth plan that includes training resources and is designed to make career field training identifiable, eliminate duplication, and is budget defensible. 2EXXX CFETPs are posted at http://www.il.hq.af.mil/ilm/ilmm/cemaint/index.html and http://www.keesler.af.mil/81trss/qflight.

Career Training Guide (CTG). A document that uses Task Modules (TM) in lieu of tasks to define performance and training requirements for a career field.

Continuation Training. Additional advanced training exceeding the minimum upgrade training requirements with emphasis on present or future duty assignments.

Core Task. A task Air Force Career Field Managers (AFCFM) identify as a minimum qualification requirement within an Air Force specialty or duty position.

Course Training Standard (CTS). A CTS is developed for all courses not governed by an STS, including specialized training packages and computer-based training courses.

Enlisted Specialty Training (EST). A mix of formal training (technical school) and informal training (on-the-job) to qualify and upgrade airmen in each skill level of a specialty.

Exportable Training. Additional training via computer assisted, paper text, interactive video, or other necessary means to supplement training.

Instructional System Development (ISD). A deliberate and orderly, but flexible process for planning, developing, implementing, and managing instructional systems. It ensures personnel are taught in a cost efficient way the knowledge, skills, and attitudes essential for successful job performance.

Initial Skills Training. A formal resident courses resulting in award of the 3-skill level.

Major Command (MAJCOM).

Occupational Survey Report (OSR). A detailed report showing the results of an occupational survey of tasks performed within a particular AFS.

On-the-Job Training (OJT). Hands-on, over-the-shoulder training conducted to certify personnel in both upgrade (skill level award) and job qualification (duty position certification) training.

Qualification Training. Actual hands-on task performance based training designed to qualify airmen in a specific duty position. This training program occurs both during and after the upgrade training process. It is designed to provide the performance skills training required to do the job.
Resource Constraints. Resource deficiencies, such as money, facilities, time, manpower, and equipment, that preclude desired training from being delivered.

Skill Training. A formal course which results in the award of a skill level.

Specialty Training Package and COMSEC Qualification Training Package. A composite of lesson plans, test material, instructions, policy, doctrine, and procedures necessary to conduct training. These packages are prepared by AETC, approved by National Security Agency (NSA), and administered by qualified communications security (COMSEC) maintenance personnel.

Specialty Training Standard (STS). An Air Force publication that describes skills and knowledge that an airman in a particular Air Force specialty needs on the job. It further serves as a contract between the Air Educational and Training Command and the user to show the overall training requirements for an Air Force specialty code that the formal schools teach.

Standard. An exact value, a physical entity, or an abstract concept, established and defined by authority, custom, or common consent to serve as a reference, model, or rule in measuring quantities or qualities, establishing practices or procedures, or evaluating results. A fixed quantity or quality.

Task Module (TM). A group of tasks performed within an Air Force specialty that are performed together and that require common knowledge, skills, and abilities. TMs are identified by an identification code and a statement.

Total Force. All collective Air Force components (active, reserve, guard, and civilian elements) of the United States Air Force.

Training Capacity. The capability of a training setting to provide training on specified requirements, based on the availability of resources.

Training Impact Decision System (TIDES). A computer-based decision support technology designed to assist Air Force career field managers in making critical judgments relevant to what training should be provided personnel within career fields, when training should be provided (at what career points), and where training should be conducted (training setting).

Training Planning Team (TPT). Comprised of the same personnel as a U&TW however, TPTs are more intimately involved in training development and the range of issues is greater than in the U&TW forum.

Training Requirements Analysis (TRA). A detailed analysis of tasks for a particular AFS to be included in the training decision process.

Training Setting. The type of forum in which training is provided (formal resident school, on-the-job, field training, mobile training team, self-study, etc.).

Upgrade Training. Training which leads to the award of a higher skill level.

Utilization and Training Pattern. A depiction of the training provided to and the jobs performed by personnel throughout their tenure within a career field or Air Force specialty. There are two types of patterns: 1) Current pattern, which is based on the training provided to incumbents and the jobs to which they have been and are assigned; and 2) Alternate pattern, which considers proposed changes in manpower, personnel, and training policies.

Utilization and Training Workshop (U&TW). A forum of the Air Force Career Field Manager, MAJCOM Air Force Specialty Code (AFSC) career field managers, Subject Matter Experts (SMEs), and AETC training personnel that determines career ladder training requirements.

Section A - General Information

1. Purpose of the CFETP. This CFETP provides the information necessary for career field managers, training management, supervisors, and trainers to plan, develop, manage, and conduct an effective and efficient career field training program. The plan outlines the training that individuals in AFSC 2E1X1 should receive in order to develop and progress throughout their career. For purposes of this plan, training is divided into three areas: initial skills, upgrade, and continuation training. Initial skills training is the AFS specific training an individual receives upon entry into the Air Force, normally conducted by AETC at one of the technical training centers. Upgrade training identifies the mandatory courses, task qualification requirements, and Career Development Course (CDC) completion required for award of the 5-, 7-, or 9-skill level. Continuation training is additional training provided to 3-, 5-, 7-, and 9-level personnel to increase their skills and knowledge beyond the minimum required for upgrade. The CFETP has several purposes, some of which are:

1.1. Serves as a management tool to plan, develop, manage, and conduct a career field training program. Also, it is used to ensure that established training is provided at the appropriate point in an individual's career.

1.2. Identifies task and knowledge training requirements for each skill level in the specialty and recommends training throughout each phase of an individual's career.

1.3. Lists training courses available in the specialty, identifies sources of the training, and provides the training medium.

1.4. Identifies major resource constraints which impact implementation of the desired career field training program.

2. Use of the CFETP. The CFETP is maintained by the Air Force Career Field Manager (AFCFM). MAJCOM Career Field Managers and AETC review the plan annually to ensure currency and accuracy and forward recommended changes to the AFCFM. Using the list of courses in Part II, they determine whether duplicate training exists and take steps to eliminate/prevent duplicate efforts. Career field training managers at all levels use the plan to ensure a comprehensive and cohesive training program is available for each individual in the career ladder.

2.1. AETC training personnel develop/revise formal resident and exportable training based upon requirements established by the users and documented in the STS. They also develop procurement and acquisition strategies for obtaining resources needed to provide the identified training.

2.2. MAJCOM Career Field Managers ensure their training programs complement the CFETP mandatory initial skill and upgrade requirements. They also identify the needed AFJQS/AFQTPs to document unique upgrade and continuation training requirements. Requirements are satisfied through OJT, resident training, or exportable courseware/courses. MAJCOM-developed training to support this AFSC must be identified for inclusion into this plan.

2.3. 81 TRSS Qualification Training Flight (Q Flt) personnel develop AFJQS/AFQTPs base requests submitted by the MAJCOMs and according to the priorities assigned by the Communications-Electronics (C-E) Maintenance Training Advisory Group (MATAG) Working Group.

2.4. Unit level training managers and supervisors manage and control progression through the career field by ensuring each individual completes the mandatory training requirements for upgrade specified in this plan and supplemented by their MAJCOM. The list of courses in Part II is used as a reference for planning continuation or career enhancement training.

3. Coordination and Approval. The AFCFM is the approval authority. MAJCOM representatives and AETC training personnel coordinate on the career field training requirements. The AFCA Mission Area Manager (MAM) reviews CFETPs for accuracy prior to submission for approval by the AFCFM.

Section B - Career Field Progression and Information

4. Specialty Description. This information supplements that presented in AFMAN 36-2108.

4.1. **Satellite, Wideband and Telemetry Systems Apprentice/Journeyman/Craftsman.**

4.1.1. Deploys, operates, and maintains ground based satellite and Beyond Line-of-Sight (BLOS) wideband communications, telemetry, and instrumentation systems. Sustains these system though effective troubleshooting, repair, diagnostics and system performance analysis. Establishes strategic and theater connectivity via satellite and BLOS communications and information networks.

4.1.2. Duties and Responsibilities:

4.1.2.1. Performs predeployment operations and mobilization of theater deployable communications systems for transport by air, land or sea. Deploys satellite and BLOS systems and support equipment to support mission requirements. Establishes maintenance management procedures and agile logistics support channels to sustain continuous network operations. Coordinates and assist end-users and network controllers in isolating and eliminating communications connectivity problems. Remove, repair and replace assemblies, subassemblies and electronic components to optimally sustain communications networks. Prepare systems for redeployment and equipment regeneration.

4.1.2.2. Operates, inspects, and sustains MILSTAR, Defense Satellite Communications Systems (DSCS) and Air Force Satellite Communications (AFSATCOM), Troposcatter radio, Defense Meteorological Satellite Program (DMSP), Defense Support Program (DSP), Global Positioning System (GPS), instrumentation, and telemetry systems in accordance with applicable directives and Defense Information Systems Agency (DISA) publications.

4.1.2.3. Assembles, installs, and sustains equipment used to measure performance of aircraft, spacecraft, missiles, satellites, biomedical, munitions and laser systems, and hardened facilities. Analyzes equipment limitations and modifies equipment to increase operational efficiency for specific missions.

4.1.2.4. Reviews technical instructions, plans, and installation drawings. Ensures conformance to standard installation practices. Plans and schedules communications and related equipment installations. Resolves installation and maintenance discrepancies using applicable directives, diagrams and installation systems records. Inventories project and work order materials. Initiates and conducts system verification test to assess the capability and effectiveness of networks and communications systems.

4.1.2.5. Manages operations and maintenance activities. Establishes requirements for and sustains tools, support equipment, and technical documents. Establishes work standards, methods and controls. Ensures maintenance data collection documentation is correct. Implements and enforces safety standards for satellite**,** BLOS**,** instrumentation, and telemetry system operations.

4.1.3. Knowledge. Knowledge is mandatory of: Theory of basic electronics and computer principles to include solid state devices, fiber optics, high power radio frequency amplifiers, software applications, satellite tracking and servo drive mechanisms. Interprets publications, blueprints, logic diagrams and schematics. Understand communications theory and principles of theater deployable and strategic systems and their operational procedures. Requires knowledge of data analysis procedures, test equipment and network analysis; principles of multiplexing, analog to digital conversion, and digital transmissions; networks associated with multichannel equipment; installing and testing practices; atomic frequency generating devices; voice and data communications equipment using DISA technical and satellite control and testing procedures.

4.2. **Satellite, Wideband and Telemetry Systems Superintendent.**

4.2.1. Specialty Summary. Manages and directs communication systems maintenance activities.

4.2.2. Duties and Responsibilities. This specialty “caps” at the Senior Master Sergeant level with those personnel that came-up through the 2E0XX and 2E1XX career fields. Therefore, the duties and responsibilities defined below encompass the complete spectrum of this specialty.

4.2.2.1. Plans, and organizes communication systems maintenance activities. Establishes production controls and performance standards according to technical publications. Prepares and analyzes reports. Maintains liaison with other organizations to ensure quality of service and to resolve technical and operational difficulties.

4.2.2.2. Directs communication systems maintenance activities. Ensures conformance with prescribed quality and safety standards including hazardous communications program. Establishes priority for completing equipment repair for communication systems. Observes performance of such functions as testing and repairing equipment and installing new components. Establishes maintenance and repair policies, procedures, and technical orders. Supervises maintenance documentation and report preparation.

4.2.2.3. Inspects and evaluates communication systems maintenance activities. Conducts inspection of communication systems maintenance activities to determine operational status and solves maintenance problems. Reviews inspection findings and recommends corrective actions.

4.3. **Chief Enlisted Managers (CEM) Code 2E000, Communications-Electronics Systems Maintenance Manager.** This specialty “caps” at the Chief Master Sergeant level with those specialties that came-up through 2E0XX, 2E1XX, 2E2XX, 2E3XX, and 2E6XX career ladders. Personnel attaining the rank of Chief are assigned broad ranging duties in directing and managing diverse functions such as directing activities that install, remove, relocate, repair, and maintain radar systems (air traffic control and aircraft control and warning), computers, telephone systems, satellite, radio, navigation and meteorological systems, visual/imagery/intrusion detection, secure communications systems, and antenna/cable systems. Other challenges that these Chiefs face are assignments to the White House Communications Agency, Air Force Element at CENTCOM, the Air Force Communications Agency (AFCA), Defense Information Systems Agency, NATO, etc.

5. Skill/Career Progression. Adequate training and timely progression from the apprentice to the superintendent skill level plays an extremely important role in the Air Force's ability to accomplish its mission. Therefore, it is essential that everyone involved in career field training do their part to plan, develop, manage, and conduct an effective and efficient training program. The guidance provided in this part of the CFETP ensures individuals receive viable training at the appropriate points in their careers. The following narrative, and AFSC 2E1X1 Education and Training Path table, establishes guidance for the "training road map." It defines what training is required and the year group spectrum in an individual's career when the training should be received.

5.1. Apprentice (3-Level) Training. Initial skills training in the Satellite, Wideband and Telemetry Systems specialty consists of the tasks and knowledge training provided in the 3-level resident courses located at Lackland AFB, TX and Fort Gordon, GA. Initial skills training requirements were identified during the 1-4 February 1999 Utilization and Training Workshop. The decision to train specific tasks and knowledge items in the initial skills course was based on a review of Occupational Survey Report (OSR) data, Training Requirements Analysis (TRA) data, and input from AFS Subject Matter Experts. Task and knowledge training requirements are identified in Attachments 1 and 2 of the STS. In order to be awarded AFSC 2E131 individuals must complete the initial skills course.

5.2. Journeyman (5-Level) Training. Upgrade training to the 5-level in the Satellite, Wideband and Telemetry Systems specialty consists of tasks and knowledge training provided in the CDCs in addition to AFJQS/AFQTP requirements. Upgrade and qualification training requirements for the 5-level are identified in Attachment 3 of the STS and in applicable AFJQS/AFQTP included in Part II of this plan and shown in the Education and Training Path table. In order to be awarded AFSC 2E151, an individual must successfully complete CDC 2E151 and be certified on those items identified by an "X" in AFJQS 2EXXX-200B, 2EXXX C-E Enlisted Specialty Training. They must also be certified on all items identified by an "X" in the OJT upgrade column of the 2E151 CTG, items identified by an "X*" that are assigned to their duty position, items identified by a "-" that are required by the local unit, and also be certified on assigned AFJQS/AFQTP tasks (AFI 36-2101 and AFMAN 36-2108). Continuation training is available upon award of the 5-level and should be utilized based on an individual's particular duty position or other training needs. Continuation training is available but not limited to the training listed in Part II of this plan.

5.3. Craftsman (7-Level) Training. Upgrade and qualification training requirements for the 7-level are identified in Attachment 4 of the STS. Additional upgrade and qualification training requirements for the Satellite, Wideband and Telemetry Systems specialty consist of those items shown in the Education and Training Path table. In order to be awarded AFSC 2E171 an individual must successfully complete mandatory 7-level minimum upgrade requirements to include AFQTP 2EXXX-201L, C-E Work Center Manager's Handbook, and resident Communications-Electronics Career Advancement Course (E3AAR2EX7X-000 at Keesler AFB MS or L3AAR2EX7X-000 at Lackland AFB TX). They must also be qualified on tasks identified as mandatory for upgrade in the 2E171 CTG (AFI 36-2101 and AFMAN 36-2108) and be certified on assigned AFJQS/AFQTP tasks. Continuation training is available, but not limited to the training listed in Part II of this plan. It should be utilized based on individual's particular training needs.

5.4. Superintendent (9-Level) Training. Upgrade training requirements consists of those items shown in the Education and Training Path table, for example AFQTP 2EXXX-201LB, C-E Managers Handbook. In addition to the Senior Noncommissioned Officer Academy (SNCOA) course, completion of CDCs associated with career fields outside of their career ladder is recommended, preferably as they are working toward their 9-level.

6. Training Decisions. The CFETP was developed to encapsulate an entire spectrum of training requirements for the Satellite, Wideband and Telemetry Systems career field, using a building block approach (simple to complex). Included in this spectrum was the strategy of when, where, and how to meet the training requirements. The strategy must be apparent and affordable to reduce duplication of training and eliminate a disjointed approach to training.

6.1. Continuation Training: Any additional knowledge and skill requirements which were not taught through initial skills or upgrade training were assigned to continuation training. The purpose of the continuation training program is to provide additional advanced training exceeding the minimum upgrade training requirements with the emphasis on present and future duty positions. MAJCOMs may develop a continuation training program to ensure individuals in the Satellite, Wideband and Telemetry Systems specialty receive the necessary training at the appropriate point in their career. The training program will identify both mandatory and optional training requirements.

7. Community College of the Air Force (CCAF) Academic Programs. Enrollment in CCAF occurs upon completion of basic military training. CCAF provides the opportunity for all enlisted members to obtain an Associate in Applied Science degree. The degree must be completed before student separates from the Air Force, retires, or commissioned as an officer. In addition to its associates degree program, CCAF offer the following:

7.1. Occupational Instructor Certification. The College offers the Occupational Instructor Certification to instructors teaching full time in a CCAF affiliated school. To qualify, instructors must complete an

instructor course, a teaching practicum, have two years teaching experience, hold an associate or higher degree, and be recommended by their commander/commandant.

7.2. The Electronic Systems Technology (4VHP) program applies to 2EXXX career fields.

7.2.1. Degree Requirements: You must hold the 5-skill level to graduate in all programs.

	Semester hours
Technical Education	24
Leadership, Management, and Military Studies	6
Physical Education	4
General Education	15
Program Electives	15
Total	64

7.2.2. Technical EducatioN (24 semester hours): A minimum of 12 semester hours of Technical Core subjects and courses must be applied and the remaining semester hours will be applied from Technical Core/Technical Elective subjects and courses.

7.2.3. Leadership, Management, and Military Studies (6 semester hours): Professional Military Education and/or civilian management courses. See CCAF General Catalog for application of civilian management courses.

7.2.4. Physical Education (4 semester hours): Satisfied upon completion of basic military training.

7.2.5. General Education (15 semester hours): Courses must meet the Criteria for Application of Courses to the General Education Requirement and be in agreement with the definitions of Applicable General Education subjects/courses as outlined in the CCAF General Catalog.

7.2.6. Program Elective (15 semester hours): Satisfied with applicable Technical Education, Leadership, Management, and Military Studies; or General Education subjects and courses, including natural science courses meeting General Education requirement application criteria. Six semester hours of CCAF degree applicable technical credit otherwise not applicable to this program may be applied.

7.3. See the current CCAF General Catalog for details regarding the Associates of Applied Science in Electronic Systems Technology. The catalog is available at your education officer or from http://www.au.af.mil/au/ccaf.

7.4. Additional off-duty education is a personal choice that is encouraged for all. Individuals desiring to become an Air Education and Training Command instructor should be actively pursuing an associate's degree. A degreed faculty is necessary to maintain CCAF's accreditation through the Southern Association of Colleges and Schools.

8. Career Path Information.

8.1. Enlisted Career Allocation. The following summarizes career progression and personnel allocations across the career ladder. 2E1XX and 2E0X1 personnel maintain their individual AFSC identifiers through the rank of MSgt. Upon promotion to SMSgt, AFSC 2E1X1, 2E1X2, 2E1X3, 2E1X4, and 2E0X1 merge to become a 2E190. At Chief, the 2E190 merges with other 2EXXX 9-level specialties to become a 2E000. Specific demographic information is available on the Web at http://www.afpc.randolph.af.mil/demographics/demograf/CAFSC.html.

2E1X1, SATELLITE, WIDEBAND AND TELEMETRY SYSTEMS
EDUCATION AND TRAINING PATH

EDUCATION AND TRAINING REQUIREMENTS	AVERAGE SEW ON TIME AND COMMENTS
BASIC MILITARY TRAINING SCHOOL	
APPRENTICE TECHNICAL SCHOOL - 3 SKILL LEVEL E5ABA2E131 002 ..... Mandatory	Airman .....6 months
UPGRADE TO JOURNEYMAN - 5 SKILL LEVEL Minimum 15 months OJT training. Complete 5-Level CDC's. ..... Mandatory Specific AFJQS/AFQTPs for equipment at assigned location. ..... Mandatory Maintenance Management and Generic AFJQS/AFQTPs for various unit level duties. ..... Mandatory AETC Supplemental training courses as determined by MAJCOM ..... Optional AFETS/CFS/SMT training as determined by MAJCOM ..... Optional	A1C .....16 months SrA .....36 months Earliest .....36 months HYT .....10 years
AIRMAN LEADERSHIP SCHOOL (ALS) Attendance is limited to SSgt selectees or those attaining 48 months Total Active Federal Military Service (TAFMS) and who have not been selected for promotion to SSgt. Completion is mandatory before assuming the rank of SSgt. ANG/AFRC may complete by correspondence course. ..... Mandatory	TRAINER: Any rank may qualify as a trainers provided they: attend a formal OJT Trainer course, are officially appointed by the commander, and are certified on the task they are training.
UPGRADE TO CRAFTSMAN - 7 SKILL LEVEL Minimum rank of SSgt. 18 months OJT training. Completion of AFQTP 2EXXX-201L, Work Centers Managers Handbook. Attendance at formal 7-level school. Must be 7-level to sew on TSgt. ..... Mandatory Maintenance Management and Generic AFJQS/AFQTPs for various unit level duties. ..... Mandatory AETC Supplemental training courses as determined by MAJCOM ..... Optional AFETS/CFS/SMT training as determined by MAJCOM ..... Optional	SSgt .....7.5 years Earliest .....36 months HYT .....20 years TSgt .....12.5 years Earliest .....5 years HYT .....20 years CERTIFIER: Must be a SSgt and possess at least a 5-skill level or equivalent experience (civilian), attend a formal OJT Certifier course, be officially appointed by the commander and certified on the task they are certifying. Be a person other than the trainer.

2E1X1, SATELLITE, WIDEBAND AND TELEMETRY SYSTEMS
EDUCATION AND TRAINING PATH

EDUCATION AND TRAINING REQUIREMENTS	AVERAGE SEW ON TIME AND COMMENTS
NONCOMMISSIONED OFFICER ACADEMY (NCOA). Attendance is limited to TSgt's or TSgt selectees. Completion is mandatory before assuming the rank of MSgt. ANG/AFRC may attend in-residence as SSgt or TSgt or complete correspondence course. NCOA Correspondence Course ..... Optional	MSgt .....16 years Earliest .....8 years HYT .....24 years
USAF SENIOR NONCOMMISSIONED OFFICER ACADEMY (SNCOA) Attendance is limited to SMSgt's or SMSgt selectees or selected MSgt's. Completion is mandatory before assuming the rank of CMSgt. ..... Mandatory SNCOA Correspondence Course..... Optional ANG/AFRC may complete by correspondence course. ANG/AFRC MSgt's may attend in-residence..... Mandatory	SMSgt .....19.2 years Earliest .....11 years HYT .....26 years
UPGRADE TO SUPERINTENDENT - 9 SKILL LEVEL Minimum rank of SMSgt. Must be graduate of resident SNCOA. (Per above section, ANG/AFRC may complete by correspondence course.) Complete AFQTP 2EXXX-201LB, C-E Managers Handbook..... Mandatory Maintenance Management and Generic AFJQS/AFQTPs for various unit level duties. ..... Mandatory	CMSgt .....21.5 years Earliest .....14 years HYT .....30 years

Section C - Skill Level Training Defined

9. Purpose. The various skill levels in the career field are defined in terms of tasks and knowledge requirements for each skill level in the Satellite, Wideband and Telemetry Systems career field of the Communications-Electronics Systems career ladder. They are stated in broad, general terms and establish the standards of performance. An all encompassing core task list has not been developed for this specialty because of the diversity of the missions supported, and the equipment installed to meet mission requirements. *Core tasks, knowledge items, and skill requirements for this specialty are identified in the STS, CDCs, AFJQS/AFQTPs, etc. Completion of the mandatory 3-level skill awarding course, the mandatory use and completion of CDCs, the mandatory 7-level course, and completion of applicable AFJQS/AFQTPs define the Air Force core tasks for this specialty.*

10. Specialty Qualification.

10.1. **Apprentice (3-level) Training Requirements.**

10.1.1. Qualification Requirements. Completion of high school with courses in algebra, geometry, trigonometry, physics, and a basic knowledge of computers is desirable. Eligibility for a Secret security clearance is mandatory for award and retention of the semiskilled AFSC. Normal color vision is mandatory for entry into this AFSC. Qualification to operate a government vehicle is mandatory for entry into this AFSC.

10.1.2. Training Sources. Formal training is accomplished through the E5ABA2E131 002 course at Ft Gordon AIN, GA. The current STS identifies all tasks trained through the formal course.

10.1.3. Training Resources. The AETC Technical Training Center, Lackland AFB, TX, provides Electronics Principles training. Knowledge and performance training on the following equipment is conducted at Det 1, 338 TRS, Ft. Gordon, GA:

10.1.3.1. The current equipment used in the 3-level skill awarding course is:

AN/TSC-85B(V)2, SHF Tactical Satellite Terminal
AN/TSC-94A(V)1 SHF, Tactical Satellite Terminal
Lightweight Multi-Band SATCOM Terminal
AN/FCC-100, Low Speed, Time Division Multiplexer
Integrated Digital Network Exchange
AN/TSC-93B(V)2, SHF Tactical Satellite Terminal
AN/TSC-100A(V)1 SHF, Tactical Satellite Terminal
AN/TRC-170, Tropospheric Scatter Radio Set
TROPO Satellite Support Radio (TSSR)
TD-1234, Remote Multiplexer Combiner

NOTE: The above equipment is used as training vehicles in the skill awarding course since they incorporate most of the basic principles and procedures found in the remainder of the AFSC's equipment inventory.

10.1.3.2. The following test equipment is used in the 3-level skill awarding course:

Oscilloscope
Analog Multimeter
Digital Multimeter
Power Meters
Vibraground
Attenuators
Frequency Counters
Sweep Generators
Signal Generators

10.1.4. Implementation. Entry into training is accomplished by reserving a position in the career field upon entry into the Air Force.

10.2. **Journeyman (5-level) Training Requirements.**

10.2.1. Qualification Requirements. All 2E131 qualifications apply to the 2E151 requirements. Additionally, knowledge is mandatory of application and theory of electronics including solid state components and digital techniques, integrated circuits, transistors, microminiature components, fiber optics, parametric amplifiers, waveguide components, traveling wave tubes, klystrons, and low-noise amplifiers; principles of computers, networks, cryogenics, spread spectrum techniques, satellite tracking, and servo drive mechanisms; use of test equipment, theory of instrumentation and telemetry systems; pulse and continuous modulation, synchros and servo drives; high power transmission systems and associated environmental control systems; space systems equipment operational procedures; data transmission; basic principles of analog-to-digital and digital-to-analog conversion, hydraulics, computer configuration, and information flow; communications theory; principles of fixed and deployable wideband and satellite earth terminal communications systems and equipment, and their operational procedures; satellite orbital mechanics; data analysis procedures; test equipment and circuit analysis; principles of multiplexing, digital data transmission; networks associated with multichannel equipment; installing and testing practices; atomic frequency generating devices; voice and data communication equipment including Defense Information Systems Agency technical and satellite control and testing procedures; interpretation of technical data, blueprints, drawings, wiring and logic diagrams, and schematic diagrams; military specifications and standards; Air Force maintenance management, supply procedures, resource protection, and funds management; application of mathematics including algebraic formulas and physics as applied to instrumentation and telemetry systems; numbering systems and Boolean algebra. Experience is mandatory in performing functions such as installing, maintaining, repairing, modifying or operating fixed or transportable wideband and earth terminal communications systems. Completion of the basic Satellite, Wideband and Telemetry Systems equipment course is mandatory for award of the semiskilled AFSC.

10.2.2. Training Sources. CDCs provide the career knowledge training required. The current STS shows the tasks that are trained through CDC material and mandatory task required for upgrade training. Continuation/Qualification training and OJT are provided by qualified trainers using AFJQS/AFQTPs written for equipment end items.

10.2.3. Training Resources. CDC 2E151 is available for upgrade purposes through the unit training manager. For individual qualification and cross-utilization training, CDCs can be ordered through the unit training office. AFJQS/AFQTPs are developed by the 81 TRSS Q Flt and may be downloaded from http://www.keesler.af.mil/81trss/qflight. Procedures for requesting development of AFJQS/AFQTPs are contained in AFI 36-2233. AFJQS/AFQTPs are listed in Part II, Section D of this CFETP. Air Force Engineering and Technical Service (AFETS), Contract Field Service (CFS), and Special Maintenance Team (SMT) training may be requested to provide on-site training on Satellite, Wideband and Telemetry Systems equipment maintenance subjects. Requests for AFETS, CFS or SMT training should be directed to your MAJCOM.

10.2.4. Implementation. Entry into formal journeyman upgrade training is accomplished upon an individual's assignment at their first duty station. Qualification training is initiated anytime an individual is assigned duties that they are not qualified on. CDCs and AFJQS/AFQTPs should be used concurrently to obtain the necessary qualification for refresher and cross-utilization training.

10.3. **Craftsman (7-level) Training Requirements.**

10.3.1. Qualification Requirements. All 2E131 and 2E151 qualifications apply to the 2E171 requirements. Qualification is also mandatory as Satellite, Wideband and Telemetry Systems Journeyman.

10.3.2. Training Sources. Completion of AFQTP 2EXXXX-201L, Communications-Electronics Work Center Managers Handbook is mandatory. Formal 7-level training is accomplished at Keesler AFB, MS (E3ACR2EX7X 002 (Active Duty), -003 (Guard)) or at Lackland AFB, TX (L3ACR2EX7X 002 (Active Duty only). The current STS shows mandatory tasks for upgrade training. Continuation/qualification training

and OJT are provided by qualified trainers using AFJQS/AFQTPs written for equipment end items and unit management functions.

10.3.3. Training Resources. AFJQS/AFQTPs are Air Force Publications and are mandatory for use in qualification training. AFJQS/AFQTPs are developed by the 81 TRSS Q Flt and may be downloaded from http://www.keesler.af.mil/81trss/qflight. Procedures for requesting development of new AFJQS/AFQTPs are contained in AFI 36-2233. AFJQS/AFQTPs are listed in Part II, Section D of this CFETP. AFETS, CFS, and SMT training may be requested to provide on-site training on Satellite, Wideband and Telemetry Systems equipment maintenance subjects. The AFETS program is outlined in AFI 21-110. Requests for AFETS, CFS or SMT training should be directed to your MAJCOM.

10.3.4. Implementation. Entry into OJT is initiated when an individual has obtained the necessary rank and skill level. Qualification training is initiated anytime an individual is assigned duties that they are not qualified on. AFJQS/AFQTPs should be used concurrently to obtain the necessary qualification for refresher and cross-utilization training.

10.4. **Superintendent (9-level) Training Requirements.**

10.4.1. Qualification Requirements. Knowledge is mandatory of: the application of electronics principles to communications systems, interoperability of communications systems, and interpretation of blueprints and technical orders. Knowledge is desirable of communication systems operating techniques, Air Force supply procedures, resource protection, funds management, personnel management, and administrative techniques. Experience is mandatory in directing functions such as installing, maintaining, repairing, or modifying communication systems and equipment. Qualification is mandatory as a Satellite, Wideband and Telemetry Systems Craftsman, Meteorological and Navigation System Craftsman, Ground Radio Communications Craftsman, Visual Imagery and Intrusion Detection System Equipment Craftsman. Eligibility for a Secret security clearance is mandatory for award and retention of this AFSC.

10.4.2. Training Sources. Completion of AFQTP 2EXXX-201LB, Communications-Electronics Managers Handbook is mandatory. Completion of CDCs associated with related 2E1XX career fields is recommended. (See Note in paragraph 4.3.)

RELATED 2EXXX CAREER FIELDS
2E0X1, Ground Radar Systems
2E1X2, Meteorological and Navigation Systems
2E1X3, Ground Radio Communications
2E1X4, Visual Imagery and Intrusion Detection Systems

10.4.3. Training Resources. For individual qualification training, CDCs can be ordered through the unit training office. AFJQS/AFQTPs are developed by the 81 TRSS Q Flt and may be downloaded from http://www.keesler.af.mil/81trss/qflight. AFJQS/AFQTPs are available for a large number of AFSCs, Maintenance Management, and Generic Training Products. These products are listed in Part II, Section D of this CFETP and other related AFSC's Career Field Education and Training Plan.

10.4.4. Implementation. Entry into OJT is initiated when an individual has been selected for the rank of SMSgt. Qualification training is initiated any time an individual is assigned duties they are not qualified on.

Section D - Resource Constraints

11. Purpose. This section identifies known resource constraints which preclude optimal/desired training from being developed or conducted, including information such as part numbers, national stock numbers, number of units required, cost, manpower, etc. Narrative explanations of each resource constraint and an impact statement describing what effect each constraint has on training are included. Finally, in this section, actions required, OPR, and target completion date are included. Resource constraints will be, at a minimum, reviewed and updated annually.

12. Apprentice Level Training.

12.1. Constraints. Det 1, 338 TRS lacks required LMST terminal and INDX equipment.

12.1.1. Impact: Will teach only theory until equipment is received.

12.1.2. Resources Required: LMST and IDNX hardware.

12.1.3. Action Required: AETC work with ESC and ACC to obtain LMST terminal. Identify source and funding required to obtain IDNX.

12.2. OPR/Target Completion Date. LMST OPR ESC/MCV, ACC/SCCX, Det 1, 338 TRS. Hardware expected mid-CY00. IDNX OPR: 338 TRS. Equipment availability TBD.

13. **Five-Level Training.**

13.1. Constraints.

13.1.1. Impact: N/A.

13.1.2. Resources Required: N/A.

13.1.3. Action Required: N/A.

13.2. OPR/Target Completion Date. N/A.

14. **Seven-Level Training.**

14.1. Constraints.

14.1.1. Impact: N/A.

14.1.2. Resources Required: N/A.

14.1.3. Action Required: N/A.

14.2. OPR/Target Completion Date. N/A.

Section E - Transitional Training Guide

This section not used.

PART II

Section A, Specialty Training Standard

1. Implementation. The implementation of training in support of this STS is with class beginning 20000510 and graduating 20000914.

2. Purpose. As prescribed in AFI 36-2201, this STS:

2.1. The Course Training Standards (CTS at Attachments 1 and 2):

2.1.1. Establish the training requirements for airmen to perform 3-skill level duties in the Satellite, Wideband and Telemetry Systems career ladder of the Airman Communications-Electronics Systems career field. The training tasks are based on an analysis of duties in AFMAN 36-2108 for AFSC 2E131.

2.1.2. Provide the basis for the development of more detailed materials, training objectives and training evaluation instruments for the course.

2.1.3. Lists in Attachment 1 the electronic fundamentals/applications requirements for this specialty.

2.1.4. Show formal training requirements. Attachment 2 contains a list of behavioral statements which describe job performance requirements that the graduate demonstrates on the job as a result of training received in course E5ABA2E131-002 (PDS Code SWO) as described in the Air Force Education and Training Course Announcements (ETCA) database, formally AFCAT 36-2223, USAF Formal Schools Catalog. Constraints and/or guidelines to training are explained Part I, Section D and in the Preface to Attachment 1. When notes or explanations describe constraints in the skill awarding course they indicate that training on those items is restricted due to the limitation described.

2.2. The Five-level Career Training Guide (CTG) at Attachment 3:

2.2.1. Provides a complete list of continuation training requirements for the award of AFSC 2E151. The behavioral code key used to indicate the type of training provided by career development courses is contained as part of Attachment 3.

2.2.2. Identifies the mandatory task and knowledge training, as listed in Attachment 3, which is required for the 5-skill level in the Satellite, Wideband and Telemetry Systems career field of the Airman Communications-Electronic Systems career ladder. These are based on an analysis of duties and responsibilities as outlined in AFMAN 36-2108.

2.3. The Seven-Level Career Training Guide (CTG) at Attachment 4:

2.3.1. Provides a complete list of continuation training requirements for the award of AFSC 2E171. The behavioral code key used to indicate the type of training, which will be provided, is contained as part of attachment 4.

2.3.2. Identifies the mandatory task and knowledge training, as listed in Attachment 4, which is required for the 7-skill level in the Satellite, Wideband and Telemetry Systems ladder of the Airman Communications-Electronics Systems career field. These are based on an analysis of duties and responsibilities as outlined in AFMAN 36-2108.

2.4. The CTGs (at Attachments 3 and 4):

2.4.1. Provide OJT certification columns to record completion of task and knowledge training requirements. Use automated training management systems to document technician qualifications, if available. Task certification must show a start and stop date.

2.4.2. Becomes a job qualification standard for on-the-job training when placed in AF Form 623, On-the-Job Training Record, and used according to AFI 36-2201. OJT tasks in column 1 are trained to the go/no go level. Go means the individual can perform the task without assistance and meet local requirements for accuracy, timeliness, and correct use of procedures.

2.4.2.1. Training Documentation. Document and certify completion of training. Identify duty position requirements by circling the subparagraph number next to the task statement. Complete the following columns in Part II of the CFETP:

2.4.2.1.1. Initial Certification. Evaluate qualifications and when verified certify using:

2.4.2.1.1.1. Core/Critical Tasks. Start date, stop date, trainee's initials, trainer's initials, and certifier's initials.

2.4.2.1.1.2. Non-Core/Non-Critical Tasks. Start date, stop date, trainee's initials, and trainer's initials.

2.4.2.1.2. Transcribing From Old Document to CFETP. Evaluate current qualifications and when verified recertify using:

2.4.2.1.2.1. Tasks Previously Certified and Required in Current Duty Position (Core/Critical Tasks). Current date as completion date, trainee's initials, and certifier's initials.

2.4.2.1.2.2. Tasks Previously Certified and Required in Current Duty Position (Non-Core/Non-Critical Tasks). Current date as completion date, trainee's initials, and trainer's initials.

2.4.2.1.2.3. Tasks Previously Certified, but not Required in Current Duty Position. Carry forward only the previous completion date of certification (not the initials of another person). If and when transcribed tasks become duty position requirements, recertify using standard certification procedures.

2.4.2.1.2.4. The person whose initials appear in the trainer or certifier block during the transcription process must meet the requirements of their prescribed roles.

2.4.2.1.2.5. Give the member the old CFETP upon completion of transcription.

2.4.2.1.3. Documenting Career Knowledge. When a CDC is not available: the supervisor identifies STS training references the trainee requires for career knowledge and ensures, as a minimum, that trainees cover the mandatory items in AFI 36-2108. For two time CDC course exam failures, supervisors identify al STS items corresponding to the areas covered by the CDC. The trainee completes study of the STS references, undergoes evaluation the task certifier, and receives certification on the STS. NOTE: Career knowledge must be documented prior to submitting a CDC waiver.

2.4.2.1.4. Decertification and Recertification. When an airman is found to be unqualified on a task previously certified, the supervisor line through the previous certification or deletes previous certification when using an automated system. Appropriate remarks are entered on the AF Form 623A On-The-Job Training Record Continuation Sheet as to the reason for decertification. The individual is recertified using the normal certification process.

2.4.3. Indicates career knowledge provided in the 5-skill level CDCs. See ECI/AFSC/CDC listing maintained by the unit OJT manager for current CDC listings.

2.4.4. Is a guide for development of promotion tests used in the Weighted Airman Promotion System (WAPS). Specialty Knowledge Tests (SKT) are developed at the USAF Occupational Measurement Squadron by senior NCOs with extensive practical experience in their career fields. The tests sample knowledge of CTG subject matter areas judged by test development team members to be most appropriate for promotion to higher grades. Questions are based upon study references listed in the WAPS catalog. Individual responsibilities are in chapter 1 of AFI 36-2605.

3. Recommendations. Comments and recommendations are invited concerning quality of AETC training. Reference this STS and address correspondence regarding changes to 81 TRG/CCVT 825 Hercules St, Suite 101 Keesler AFB MS 39534-2037. Use the 81st TRG Customer Service Information Line (DSN 597-4566) to identify graduates who may have received over or under training on task/knowledge items listed in this training standard.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

OFFICIAL

MICHAEL E. ZETTLER, Lieutenant General, USAF
Deputy Chief of Staff /Installations and Logistics

Attachments:
1. Electronic Fundamental/Application Training
2. Course Training Standard, 2E131
3. Five Level Career Training Guide, 2E151
4. Seven Level Career Training Guide, 2E171

PREFACE

NOTE 1: Objectives which include the statement “with assistance” indicates that students may be allowed two assists from the instructor and still successfully achieve the proper level of proficiency. An instructor assist is defined as anytime an instructor must intercede to provide guidance to a student which leads to a satisfactory completion of the objective or to prevent the student from continuing in a manner which will lead to an unsatisfactory conclusion, safety violation, or damage to equipment. Objectives which include the statement “without assistance” indicates that students must successfully complete the objective without instructor intervention.

NOTE 2: Objectives identified by “③” are taught in residence as part of the Electronics Principles portion of the 3-level skill awarding course.

NOTE 3: Objectives identified by “⑤” are included in the 5-level Career Development Course (CDC). The statement itself combined with the verb selection reflects the depth of the information presented in the CDCs.

NOTE 4: All objectives by “③” are trained during wartime.

1. BASIC TERMS.
TRs: TOs 31-1-141-2, 31-1-141-5

1.1. Metric Notation:

1.1.1. Perform conversions using metric notation and electrical prefixes. (③/⑤)

1.1.2. Perform math operations using powers of ten. (③/⑤)

1.2. Use Direct Current (DC) terms properly. (③/⑤)

1.3. Use Alternating Current (AC) terms properly. (③/⑤)

2. BASIC CIRCUITS.
TRs: TOs 31-1-141-2, 31-1-141-9

2.1. Identify basic circuit operating principles. (③/⑤)

2.2. Troubleshoot a basic electronic circuit. (③)

3. BASIC CIRCUIT CALCULATIONS.
TR: TO 31-1-141-5

3.1. Calculate circuit values for a basic DC circuit. (③/⑤)

3.2. Calculate circuit values for a basic AC circuit. (③/⑤)

4. RESISTORS.
TRs: TOs 31-1-141-2, 31-1-141-15

4.1. Identify resistor operating principles. (③/⑤)

4.2. Troubleshoot resistors. (③)

4.3. Use a resistor color code chart to determine facts about resistors. (③)/⑤)

5. RELAYS AND SOLENOIDS.
TRs: TOs 31-1-141-2, 31-1-141-3

5.1. Identify relay circuit operating principles. (③/⑤)

5.2. Troubleshoot a relay circuit. (③)

5.3. Identify solenoid circuit operating principles. (③/⑤)

5.4. Troubleshoot a solenoid circuit.

6. INDUCTORS.
TRs: TOs 31-1-141-2, 31-1-141-15

6.1. Identify inductor operating principles. (③/⑤)

6.2. Troubleshoot an inductor. (③/⑤)

6.3. Calculate inductor circuit values. (③/⑤)

7. CAPACITORS.
TRs: TOs 31-1-141-2, 31-1-141-5, 31-1-141-15

7.1. Identify capacitor operating principles (③/⑤)

7.2. Troubleshoot a capacitor. (③)

7.3. Calculate capacitor circuit values. (③/⑤)

7.4. Use capacitor color code chart to determine facts about capacitors.

8. TRANSFORMERS.
TRs: TOs 31-1-141-2, 31-1-141-5, 31-1-141-15

8.1. Identify transformer operating principles. (③/⑤)

8.2. Troubleshoot a transformer. (③/⑤)

8.3. Calculate transformer circuit values. (③/⑤)

9. THREE PHASE TRANSFORMERS.
TRs: TOs 31-1-141-2, 31-1-141-15

9.1. Identify three phase transformer operating principles. (③/⑤)

9.2. Troubleshoot a three phase transformer.

10. DC MOTORS.
TRs: TOs 31-1-141-2, 31-1-141-9

10.1. Identify DC motors operating principles. (⑤)

10.2. Troubleshoot a DC motor.

11. AC MOTORS.
TRs: TOs 31-1-141-2, 31-1-141-9

11.1. Identify AC motors operating principles. (⑤)

11.2. Troubleshoot an AC motor.

12. DC GENERATORS.
TRs: TOs 31-1-141-2, 31-1-141-9, 31-1-141-13

12.1. Identify DC generator principles of operation. (⑤)

12.2. Troubleshoot a DC generator.

13. AC GENERATORS.
TRs: TOs 31-1-141-2, 31-1-141-9, 31-1-141-13

13.1. Identify AC generator principles of operation. (⑤)

13.2. Troubleshoot an AC generator.

14. ALTERNATORS.
TRs: TOs 31-1-141-2, 31-1-141-9

14.1. Identify alternator principles of operation.

14.2. Troubleshoot an alternator.

15. SYNCHRO/SERVOS.
TRs: TOs 31-1-141-2, 31-1-141-9

15.1. Identify synchro/servos principles of operation. (⑤)

15.2. Troubleshoot a synchro/servos circuit.

16. CHOPPERS (SYNCHRONOUS VIBRATORS).
TR: TO 31-1-141-2

16.1. Identify choppers (synchronous vibrators) principles of operation.

16.2. Troubleshoot a chopper.

17. TRANSDUCERS.
TRs: TOs 31-1-141-3, 31-1-141-13

17.1. Identify transducer principles of operation. (③/⑤)

17.2. Troubleshoot a transducer.

18. METER MOVEMENTS.
TRs: TOs 31-1-141-2, 31-1-141-7, 31-1-141-14C

18.1. Identify meter movement principles of operation. (③/⑤)

18.2. Troubleshoot meter movements.

19. SOLID STATE DIODES.
TRs: TOs 31-1-141-4, 31-1-141-15

19.1. Identify solid state diode operating principles. (③/⑤)

19.2. Troubleshoot a solid state diode circuit. (③)

19.3. Identify solid state diode specifications.

19.4. Use solid state diode color code chart to determine facts about the diode.

20. BIPOLAR JUNCTION TRANSISTOR.
TR: TO 31-1-141-4

20.1. Identify bipolar junction transistor operating principles. (③/⑤)

20.2. Troubleshoot a bipolar junction transistor circuit. (③/⑤)

20.3. Identify bipolar junction transistor specifications.

21. INTEGRATED CIRCUITS.
TR: TO 31-1-141-4

21.1. Identify facts and terms associated with integrated circuits (IC). (③/⑤)

21.2. Troubleshoot an integrated circuit. (③/⑤)

21.3. Identify integrated circuit specifications. (⑤)

22. SOLID STATE SPECIAL PURPOSE DEVICES.
TR: TO 31-1-141-4

22.1. Identify operating principles of special purpose devices.

22.1.1. Identify silicon controlled rectifier (SCR) operating principles. (⑤)

22.1.2. Identify zener diode operating principles. (⑤)

22.1.3. Identify tunnel diode operating principles. (⑤)

22.1.4. Identify light emitting diode (LED) operating principles. (⑤)

22.1.5. Identify liquid crystal display (LCD) operating principles. (⑤)

22.1.6. Identify unijunction transistor (UJT) operating principles. (⑤)

22.1.7. Identify junction field effect transistor (JFET) operating principles. (⑤)

22.1.8. Identify metal oxide semi-conductor field effect transistor (MOSFET) operating principles. (⑤)

22.1.9. Identify positive intrinsic negative (PIN) diode operating principles. (⑤)

22.1.10. Identify varactor operating principles. (⑤)

22.2. Troubleshoot a solid state special purpose device.

23. ELECTRON TUBES.
TRs: TOs 31-1-141-1, 31-1-141-3, 31-1-141-9

23.1. Identify electron tube operating principles. (③/⑤)

23.2. Troubleshoot an electron tube.

23.3. Identify electron tube specifications.

24. CATHODE RAY TUBES (CRT).
TRs: TOs 31-1-141-1, 31-1-141-3

24.1. Identify cathode ray tube operating principles. (③/⑤)

24.2. Troubleshoot a cathode ray tube.

25. SOLDER AND DESOLDER.
TRs: TOs 00-25-234, 1-1A-14, 31-1-141-15

25.1. Terminal connections:

25.1.1. Solder and desolder terminal connections with assistance.

25.1.2. Solder and desolder terminal connections without assistance.

25.2. Printed Circuit Boards (PCB):

25.2.1. Solder and desolder printed circuit board component connections with assistance.

25.2.2. Solder and desolder printed circuit board component connections without assistance.

25.3. Multipin connectors:

25.3.1. Solder and desolder multipin connectors with assistance.

25.3.2. Solder and desolder multipin connectors without assistance.

25.4. Coaxial connectors:

25.4.1. Solder and desolder coaxial connectors with assistance.

25.4.2. Solder and desolder coaxial connectors without assistance.

26. ASSEMBLE SOLDERLESS CONNECTORS.
TRs: TOs 1-1A-14, 31-1-141-15

26.1. Assemble solderless crimp connectors with assistance. (③)

26.2. Assemble solderless coaxial connectors with assistance. (③)

26.3. Assemble solderless multipin connectors with assistance. (③)

27. TEST EQUIPMENT USAGE.
TRs: TOs 31-1-141-1, 31-1-141-7, 31-1-141-8, 31-1-141-9, 31-1-141-10

27.1. Use the analog multimeter to measure current, voltage, and ohms. (③/⑤)

27.2. Use the oscilloscope to measure DC voltage, AC pk-pk. voltage, time of AC wave, and phase difference of two waves with assistance. (③/⑤)

27.3. Use the signal generator to provide signals. (③/⑤)

27.4. Use the frequency counter to measure frequency. (③/⑤)

27.5. Use the spectrum analyzer to analyze a multifrequency signal. (③/⑤)

27.6. Use a field strength tester to test a radiated field.

27.7. Use the digital multimeter to measure current, voltage, and ohms. (③/⑤)

27.8. Use the digital logic probe to determine the logic state.

27.9. Use the capacitor tester to determine the condition of a capacitor.

27.10. Use the capacitor substitution box to determine the capacitance.

27.11. Use the DC restorer to restore DC.

27.12. Use the logic current tracer to trace current.

27.13. Use the tube tester to determine the condition of a tube.

27.14. Use the logic pulser to pulse a logic circuit.

27.15. Use the logic analyzer to analyze a logic circuit.

27.16. Use the signature analyzer to determine the condition of a microprocessor circuit.

27.17. Use the reflectometer to determine the location and condition of a cable termination. (⑤)

28. TRANSISTOR AMPLIFIER CIRCUITS.
TRs: TOs 31-1-141-1, 31-1-141-4

28.1. Identify operating principles of transistor amplifier circuits.

28.1.1. Identify transistor amplifier operating principles. (③/⑤)

28.1.2. Identify transistor amplifier stabilization circuits operating principles. (③/⑤)

28.1.3. Identify transistor amplifier coupling circuits operating principles. (③/⑤)

28.2. Troubleshoot transistor amplifier circuit. (③/⑤)

29. ELECTRON TUBE AMPLIFIERS.
TR: TO 31-1-141-3

29.1. Identify electron tube amplifier operating principles. (③)

29.2. Troubleshoot an electron tube amplifier.

30. OPERATIONAL AMPLIFIERS (OP AMP).
TR: TO 31-1-141-4

30.1. Identify operational amplifiers operating principles. (③/⑤)

30.2. Troubleshoot an operational amplifier.

31. MAGNETIC AMPLIFIERS.
TR: TO 31-1-141-4

31.1. Identify magnetic amplifier operating principles.

31.2. Troubleshoot a magnetic amplifier.

32. SATURABLE REACTORS.
TR: TO 31-1-141-4

32.1. Identify saturable reactor operating principles.

32.2. Troubleshoot a saturable reactor.

33. POWER SUPPLY CIRCUITS.
TRs: TOs 31-1-141-3, 31-1-141-4, 31-1-141-9, 31-1-141-15

33.1. Identify operating principles of power supply circuits.

33.1.1. Identify power supply rectifier operating principles. (③/⑤)

33.1.2. Identify power supply filter operating principles. (③/⑤)

33.2. Troubleshoot a power supply circuit. (③/⑤)

34. VOLTAGE REGULATORS.
TRs: TOs 31-1-141-3, 31-1-141-4

34.1. Identify power supply voltage regulator operating principles. (③/⑤)

34.2. Troubleshoot voltage regulator circuits. (③)

35. RESISTIVE - CAPACITIVE - INDUCTIVE (RCL) CIRCUITS.
TRs: TOs 31-1-141-2, 31-1-141-5

35.1. Identify resistive-capacitive-inductive (RCL) basic (non-resonant) circuit operating principles. (⑤)

35.2. Identify RCL resonant circuit operating principles. (⑤)

35.3. Troubleshoot an RCL circuit.

35.4. Calculate RCL circuit values.

36. FREQUENCY SENSITIVE FILTERS.
TR: TO 31-1-141-2

36.1. Identify frequency sensitive filter operating principles. (③/⑤)

36.2. Troubleshoot a frequency sensitive filter circuit. (③)

36.3. Calculate frequency sensitive filter circuit values.

37. WAVE GENERATING CIRCUITS.
TRs: TOs 31-1-141-3, 31-1-141-4, 31-1-141-10

37.1. Identify operating principles of wave generating circuits.

37.1.1. Identify oscillator circuit wave generating operating principles. (③/⑤)

37.1.2. Identify multivibrator circuit wave generating operating principles. (③/⑤)

37.1.3. Identify waveshaping circuit operating principles. (③/⑤)

37.2. Troubleshoot a wave generating circuit. (③)

38. LIMITER CIRCUITS.
TR: TO 31-1-141-4

38.1. Identify operating principles of limiter circuits.

38.1.1. Identify diode limiter circuit operating principles. (⑤)

38.1.2. Identify zener diode limiter circuit operating principles.

38.1.3. Identify transistor limiter circuit operating principles.

38.2. Troubleshoot a limiter circuit.

39. CLAMPER CIRCUITS.
TR: TO 31-1-141-4

39.1. Identify clamper circuit operating principles. (⑤)

39.2. Troubleshoot a clamper circuit.

40. DIGITAL NUMBERING SYSTEMS.
TR: TO 31-1-141-5

40.1. Conversions:

40.1.1. Convert values in number systems to and from binary. (③/⑤)

40.1.2. Convert values in number systems to and from octal. (③/⑤)

40.1.3. Convert values in number systems to and from hexadecimal. (③/⑤)

40.2. Math operations:

40.2.1. Perform math operations using binary. (③/⑤)

40.2.2. Perform math operations using octal. (③/⑤)

40.2.3. Perform math operations using hexadecimal. (③/⑤)

40.3. Convert values in number systems to and from the binary coded decimal system. (③/⑤)

41. DIGITAL LOGIC FUNCTIONS.
TRs: TOs 31-1-141-4, 31-1-141-9

41.1. Identify operating principles of digital logic functions:

41.1.1. Identify main logic gates digital logic functions operating principles. (③/⑤)

41.1.2. Identify flip-flop digital logic functions operating principles. (③/⑤)

41.2. Troubleshoot a logic circuit. (③)

41.3. Identify digital logic families operating principles. (③/⑤)

42. BOOLEAN EQUATIONS.
TR: TO 31-1-141-5

42.1. Convert Boolean expressions diagrammed to equations.

42.2. Convert Boolean equations to diagrams.

42.3. Simplify Boolean equations.

43. COMPUTERS.
TRs: TOs 31-1-141-6C, 31-1-141-9

43.1. Identify computer operating principles. (③/⑤)

43.2. Load computer programs. (③)

43.3. Write and debug computer programs.

43.4. Identify principles of computer programming languages. (③)

43.5. Troubleshoot computer subassemblies or circuits. (③)

43.6. Identify types of computer memories and they're operating principles. (③/⑤)

43.7. Identify computer peripheral devices operating principles. (③/⑤)

44. MICROPROCESSOR CONTROLLED SYSTEM.
TRs: TOs 31-1-141-6C, 31-1-141-9

44.1. Identify basic (universal) microprocessor circuit operating principles in system control. (③/⑤)

44.2. 8085 (specific) Microprocessor.

44.2.1. Identify the 8085 (specific) microprocessor circuit operating principles in system control. (③)

44.2.2. Troubleshoot a microprocessor circuit. (③)

45. LOGIC CIRCUITS.
TRs: TOs 31-1-141-3, 31-1-141-5, 31-1-141-9, 31-1-141-13

45.1. Identify operating principles of logic circuits.

45.1.1. Identify counter logic circuit operating principles. (③/⑤)

45.1.2. Identify register logic circuit operating principles. (③/⑤)

45.1.3. Identify combination logic circuit operating principles. (③/⑤)

45.2. Troubleshoot a combination logic circuit. (③)

46. DIGITAL-TO-ANALOG AND ANALOG-TO-DIGITAL CONVERTERS.
TR: TO 31-1-141-13

46.1. Identify operating principles of digital-to-analog and analog to digital converters.

46.1.1. Identify weighted resistor digital-to-analog (D-A) converter operating principles. (③)

46.1.2. Identify approximation analog-to-digital (A-D) converter operating principles. (③/⑤)

46.1.3. Identify ramp analog-to-digital (A-D) converter operating principles. (③/⑤)

46.2. Troubleshoot converter circuit.

47. TRANSMISSION LINES.
TRs: TOs 31-1-141-7, 31-1-141-8, 31-1-141-9, 31-1-141-13

47.1. Identify transmission line operating principles. (③/⑤)

47.2. Perform transmission line measurements.

47.3. Calculate transmission line values.

47.4. Troubleshoot a transmission line.

48. WAVEGUIDES.
TRs: TOs 31-1-141-9, 31-1-141-11

48.1. Identify waveguide operating principles. (③/⑤)

48.2. Troubleshoot a waveguide.

49. MICROWAVE OSCILLATORS AND AMPLIFIERS.
TRs: TOs 31-1-141-3, 31-1-141-10, 31-1-141-11

49.1. Identify microwave oscillator and amplifier operating principles. (③/⑤)

49.2. Tune or adjust microwave oscillators or amplifiers.

49.3. Troubleshoot a microwave oscillator or amplifier.

50. RESONANT CAVITIES.
TRs: TOs 31-1-141-3, 31-1-141-9, 31-1-141-11

50.1. Identify resonant cavities operating principles. (③/⑤)

50.2. Troubleshoot resonant cavity circuit.

51. TRANSMITTERS.
TRs: TOs 31-1-141-4, 31-1-141-9, 31-1-141-13

51.1. Identify operating principles of transmitters.

51.1.1. Identify amplitude modulation (AM) transmitter operating principles. (③/⑤)

51.1.2. Identify frequency modulation (FM) transmitter operating principles. (③/⑤)

51.1.3. Identify single sideband (SSB) transmitter operating principles. (③/⑤)

51.1.4. Identify pulse modulation transmitter operating principles. (③/⑤)

51.2. Troubleshoot a transmitter circuit.

52. RECEIVERS.
TRs: TOs 31-1-141-4, 31-1-141-9, 31-1-141-13

52.1. Identify operating principles of receivers.

52.1.1. Identify AM receiver operating principles. (③/⑤)

52.1.2. Identify FM receiver operating principles. (③/⑤)

52.1.3. Identify SSB receiver operating principles. (③/⑤)

52.1.4. Identify pulse modulation receiver operating principles. (③/⑤)

52.2. Troubleshoot a receiver circuit.

53. TRANSMISSION POWER.
TRs: TOs 31-1-141-7, 31-1-141-8, 31-1-141-11

53.1. Perform transmission power measurements.

53.2. Calculate transmission power values.

54. ANTENNAS.
TR: TO 31-1-141-12

54.1. Identify antenna operating principles. (③)

54.2. Perform antenna alignment.

54.3. Troubleshoot an antenna.

55. MICROPHONES.
TR: TO 31-1-141-3

55.1. Identify microphone operating principles.

55.2. Troubleshoot a microphone.

56. SPEAKERS.
TR: TO 31-1-141-3

56.1. Identify speaker operating principles.

56.2. Troubleshoot a speaker.

57. PHOTOSENSITIVE DEVICES.
TRs: TOs 31-1-141-3, 31-1-141-4

57.1. Identify photosensitive devices operating principles. (③/⑤)

57.2. Troubleshoot photosensitive devices.

58. DISPLAY TUBES.
TR: TO 31-1-141-3

58.1. Identify display tubes operating principles.

58.2. Troubleshoot a display tube.

59. SUPPORT SUBJECTS.
TRs: TOs 31-1-141-1, 00-25-234, AFR 700-13, AFR 80-23

59.1. Identify safety applicable to electronics. (③/⑤)

59.2. Identify actions for first aid for electronics. (③)

59.3. Identify principles of electrostatic discharge (ESD) control to protect electronic components and circuits. (③/⑤)

59.4. Identify principles of protecting electronic components and circuits from effects of electromagnetic pulse (EMP). (③/⑤)

PREFACE

NOTE 1: Unless otherwise stated in the objective the student may be allowed two assists from the instructor and still successfully achieve the proper level of proficiency. An instructor assist is defined as anytime an instructor must intercede to provide guidance to a student which leads to a satisfactory completion of the objective or to prevent a student from continuing in a manner which will lead to an unsatisfactory conclusion, safety violation, or damage to the equipment.

NOTE 2: All equipment related objectives are performed by following procedures from a Technical Order, Technical Manual, KAM, LMM or student instructional material developed by the training facility. Test equipment used throughout the course includes the following:

Multimeter	Attenuators
Vibraground	Noise Test Set
Power Meter	Bit Error Rate Test Set
Audio Signal Generator	Loop Test Set
Sweep Generator	Digital Data Test Set
Oscilloscope	Built-in Test Equipment
Frequency Counter	Spectrum Analyzer

NOTE 3: All objective references to SHF Tactical Satellite Terminals include the following: AN/TSC-85B(V)2, AN/TSC-93B(V)2, AN/TSC-94A(V)1, and AN/TSC-100A(V)1.

NOTE 4: All objectives are trained during wartime.

1.GENERAL PRINCIPLES – In this subject area, the student shall:

1.1. Standard maintenance practices.

1.1.1. Describe basic troubleshooting procedures.

1.1.2. State facts relating to the theory and operation of local and remote loopbacks.

1.1.3. Locate information about AF maintenance practices (AFI 21-116).

1.1.4. Describe how to locate system components using alphanumeric designator.

1.1.5. Demonstrate use of technical publications.

1.2. Documentation.

1.2.1. State facts about the purpose and use of the Maintenance Data Collection Systems.

1.2.2. Input maintenance data collection information into automated system.

1.2.3. State facts about the purpose and use of the material deficiency reporting system.

1.2.4. State facts about the purpose and use of preventive maintenance inspection and equipment status reporting.

1.2.5. Identify the procedures used to process and control materiel.

1.2.6. Research parts information using applicable manuals.

1.3. Perform power measurement calculations.

1.4. Identify basic facts of the 2E1X1 career field.

1.5. Identify security concerns of the 2E1X1 career field.

1.6. Operational Risk Management (ORM).

1.6.1. State hazards associated with the AFSC.

1.6.2. State basic facts and terms about AFOSH standards for the AFSC.

1.6.3. Practice safety precautions during maintenance actions.

1.7. Agile logistics (supply, inventory management).

1.7.1. State facts about agile logistics.

1.7.2. Describe the flow of parts (depot/commercial vendor).

1.7.3. Describe the technician’s role in agile logistics.

1.8. Identify the purposes of equipment associated with the 2E1X1 career field.

1.9. Test Range Mission – In this subject area, the student shall:

1.9.1. Identify purposes and principles of the test range mission.

1.9.1.1. Research and development.

1.9.1.2. Operational test and evaluation.

1.9.2. Identify purposes and principles of instrumentation and telemetry systems.

1.9.2.1. Instrumentation System.

1.9.2.2. Telemetry System.

1.9.3. Identify purposes and principles of the test range.

1.9.3.1. Range Commander's Council.

1.9.3.2. Applicable Range Standards.

1.9.3.3. Test Range Functions.

1.10. Space Systems and Equipment – In this subject area, the student shall:

1.10.1. Identify principles pertaining to the Satellite Ground Station (SGS).

1.10.2. Identify principles pertaining to the Satellite Readout Station Upgrade (SRSU).

1.10.3. Identify principles pertaining to the Data Reduction Center.

1.10.4. Identify principles pertaining to the Satellite Operations Center.

1.10.5. Identify principles pertaining to the AN/MSQ-118 System.

1.10.6. Identify principles pertaining to the Simplified Processing Station Replacement (SRS/U).

1.10.7. Identify principles pertaining to the MARK IVB Meteorological Data Station (MDS).

1.10.8. Identify principles pertaining to the Global Positioning System (GPS).

2. TEST EQUIPMENT – In this subject area, the student shall:

2.1. Know the purposes of selected types of equipment used in the 2E1X1 career field.

2.2. Know the principles, capabilities, and limitations of the test equipment listed in note 2.

2.3. Operate the test equipment listed in note 2.

3. DIGITAL MULTIPLEXER EQUIPMENT – In this subject area, the student shall:

3.1. Identify principles, capabilities, and limitations of time division multiplexing equipment.

3.2. Perform an operational check of a time division multiplexer.

3.3. Configure a time division multiplexer for operation.

3.4. Troubleshoot and repair a time division multiplexer.

4. MODULATION EQUIPMENT – In this subject area, the student shall:

4.1. Identify principles, capabilities and limitations of modulation.

4.1.1. Spread Spectrum Multiple Access (SSMA) digital modem.

4.1.2. Time Division Multiple Access (TDMA) digital modem.

4.1.3. Demand Access Multiple Assigned (DAMA) digital modem.

4.2. Perform an operational check on a Digital MODEM.

4.3. Troubleshoot and repair a Digital MODEM.

5. FREQUENCY GENERATION AND CONVERSION EQUIPMENT – In this subject area, the student shall:

5.1. Identify principles, capabilities and limitations of frequency conversion and generation equipment.

5.2. Perform an operational check of a SHF tactical satellite equipment frequency standard.

5.3. Perform an operational check on an up-converter.

5.4. Configure an upconverter.

5.5. Troubleshoot and repair an upconverter.

5.6. Perform operational checks on a downconverter.

5.7. Configure a downconverter.

5.8. Troubleshoot and repair a downconverter.

5.9. Identify principles, capabilities and limitations of a low noise amplifier (LNA).

5.10. Perform an operational check on an LNA.

5.11.Troubleshoot and repair an LNA.

6. Identify principles, capabilities, and limitations of satellite tracking systems.

7. TIMING AND SYCHRONIZATION – In this subject area, the student shall:

7.1. Identify principles, capabilities, and limitations of timing and synchronization.

7.2. Troubleshoot and repair timing and synchronization equipment.

8. LINE-OF-SIGHT (LOS) SYSTEMS – In this subject area, the student shall:

8.1. Identify principles, capabilities and limitations of LOS systems.

8.2. Perform operational checks on a digital line of sight (LOS) radio.

8.3. Troubleshoot and repair a digital LOS radio.

9. DEPLOYABLE TROPOSPHERIC SCATTER SYSTEMS – In this subject area, the student shall:

9.1. Identify principles, capabilities, and limitations of a TRC-170 Tropospheric Scatter radio system.

9.2. Perform an operational check of AN/TRC-170 Tropospheric Scatter digital multiplexer equipment.

9.3. Configure an AN/TRC-170 Tropospheric Scatter digital multiplexer.

9.4. Perform an operational check of a AN/TRC-170 Tropospheric Scatter equipment modem.

9.5. Configure an AN/TRC-170 Tropospheric Scatter equipment modem.

9.6. Perform an operational check of a TRC-170 Tropospheric equipment radio subsystem.

9.7. Configure an AN/TRC-170 Tropospheric Scatter equipment radio subsystem.

9.8. Identify principles and capabilities of control orderwires.

9.9. Configure the AN/TRC-170 patch panels for operation.

9.10. Identify principles and capabilities of power distribution.

9.11. Identify principles and capabilities of system monitoring.

9.12. Perform system testing of AN/TRC-170 Tropospheric Scatter equipment.

9.13. Troubleshoot the AN/TRC-170 Tropospheric Scatter radio set.

9.14. Monitor circuit link quality on the AN/TRC-170 Tropospheric Scatter radio equipment.

9.15. Perform an operational check of the TRC-170 Tropospheric Scatter equipment communications link.

9.16. Configure an AN/TRC-170 Tropospheric Scatter equipment system to establish a communications link.

10. DEPLOYABLE SHF SATELLITE SYSTEMS – In this subject area, the student shall:

10.1. Identify principles of operations of SHF satellite systems.

10.2. Perform an operational check of a SHF tactical satellite equipment digital multiplexer.

10.3. Configure a SHF tactical satellite equipment digital multiplexer.

10.4. Perform an operational check of a SHF tactical satellite equipment modem.

10.5. Configure a SHF tactical satellite equipment modem.

10.6. Perform an operational check of a SHF tactical satellite equipment radio subsystem.

10.7. Configure a SHF tactical satellite equipment radio subsystem.

10.8. Perform an operational check of SHF tactical satellite antenna control equipment.

10.9. Troubleshoot and repair SHF tactical satellite antenna control equipment.

10.10. Identify principles and capabilities of control orderwires.

10.11. Identify principles and capabilities of power distribution.

10.12. Identify principles and capabilities of system monitoring.

10.13. Perform system testing of SHF tactical satellite equipment.

10.14. Troubleshoot and repair a SHF tactical satellite equipment system.

10.15. Monitor circuit link quality on SHF tactical satellite equipment.

10.16. Acquire and track a satellite using SHF tactical satellite equipment.

10.17. Perform an operational check of a SHF tactical satellite equipment communications link.

10.18. Configure a SHF tactical satellite equipment system to establish a communications link.

11. ANCILLARY EQUIPMENT – In this subject area, the student shall:

11.1. Perform an operational check on cryptographic equipment.

11.2. Configure a TROPO Satellite Support Radio (TSSR) to establish a communications link.

11.3. Configure a TD-1234 Remote Mulitplexer Combiner (RMC).

12. DEPLOYABLE MULTI-BAND SYSTEMS – In this subject area, the student shall:

12.1. Identify principles, capabilities, and limitations of operations of multi-band systems.

12.2. Perform an operational check of digital multiplexer equipment.

12.3. Configure a digital multiplexer.

12.4. Perform an operational check of an equipment modem.

12.5. Configure an equipment modem.

12.6. Perform an operational check of an equipment radio subsystem.

12.7. Configure the equipment radio sub-system.

12.8. Identify principles and capabilities of control orderwires.

12.9. Configure the patch panels for operation.

12.10. Identify principles and capabilities of power distribution.

12.11. Identify principles and capabilities of system monitoring.

12.12. Identify principles and capabilities of antenna control system.

13. NETWORK BANDWIDTH MANAGEMENT EQUIPMENT – In this subject area, the student shall:

13.1. Identify principles, capabilities, and limitations of Integrated Digital Network Exchange (IDNX) equipment.

13.2. Perform operational check and configure IDNX equipment.

14. NETWORK TRANSPORT INFRASTRUCTURE – In this subject area, the student shall:

14.1. Identify principles, capabilities, and limitations of the following network configurations.

14.1.1. Network topologies (Star, Ring, Bus, etc.).

14.1.2. Network types (LAN, WAN, VPN).

14.2. Identify principles, capabilities, and limitations of the following information transport devices:

14.2.1. Routers.

14.2.2. Hubs (Concentrators).

14.2.3. Bridges.

14.2.4. Gateways.

14.2.5. Switches:

14.2.5.1. Circuit switching.

14.2.5.2. Message switching.

14.2.5.3. Packet switching.

14.2.5.4. Asynchronous transfer mode (ATM).

15. STANDARD INSTALLATION PRACTICES – In this subject area, the student shall:

15.1. State facts related to standard installation practices.

15.2. Describe the importance of cable labeling and installation documentation.

15.3. Describe wire color coding standards.

15.4. Describe fiber optics installation concepts.

15.5. Describe the concepts of:

15.5.1. Grounding.

15.5.2. Bonding.

15.5.3. Shielding.

15.6. Identify procedures to construct and terminate cables with the following connectors:

15.6.1. Multi-pin.

15.6.2. Modular.

15.6.3. Coaxial.

16. TRANSMISSION MEASUREMENT – In this subject area, the student shall:

16.1. Perform cable transmission line measurements.

17. Identify general principles of Satellite Access Requests (SAR) procedures and processes

BEHAVIORAL FORMAT CTG CODING SYSTEM

Each CTG element is written as a behavioral statement. The detail of the statement and verb selection reflects the level of training provided.

Code	Definition
K	Subject Knowledge Training - The verb selection identifies the individual's ability to identify facts, state principles, analyze, or evaluate the subject.
P	Performance Training - Identifies the individual performed the task to the satisfaction of the course; however he/she may not be capable of meeting the field requirements for speed and accuracy.
Pk	Performance Knowledge Training - The verb selection identifies the individual's ability to relate simple facts, procedures, operating principles, and operational theory for the task.
-	When this code is used in the OJT Upgrade Column it indicates that the certification or qualification on this task is a local determination. When this code is used in the CDC Column it indicates that no training for this subject is provided in CDCs.
X	When this code is used in the OJT Upgrade Column it indicates that the individual must be trained and certified on this task before they can be upgraded to the appropriate skill level. This code indicates that training to satisfy this requirement is either provided through OJT, CDCs, or a combination of OJT and CDCs.
X*	When this code is used in the OJT Upgrade Column it indicates that the individual must be trained and certified on this task before they can be upgraded to the appropriate skill level if the assigned duty position is responsible to maintain the equipment or system indicated as assigned by the local workcenter supervisor. This code indicates that training to satisfy this requirement is normally provided through OJT.

The identification blocks listed below are to be used when the trainer is other than the trainee's immediate supervisor.

THIS BLOCK IS FOR IDENTIFICATION PURPOSES ONLY		
NAME OF TRAINEE		
PRINTED NAME *(Last, First, Middle Initial)*	INITIALS *(Written)*	SSAN
PRINTED NAME OF CERTIFYING OFFICIAL AND WRITTEN INITIALS		
N/I	N/I	
N/I	N/I	
N/I	N/I	

PREFACE

NOTE 1: Users are responsible for annotating technical references to identify current references pending CTG revision.

NOTE 2: AFJQS 2EXXX-200B, C-E Enlisted Specialty Training is mandatory for use in conjunction with this CTG. It sets the Air Force standard for qualification and certification for the following subject areas:

Career Progression Information
Information Security (INFOSEC)
Communications Security (COMSEC)
Protect MAJCOM/FOA Critical Mission Information
Physical Security
Electronic Emission Security (TEMPEST)
Electronic Warfare
AF Occupational Safety and Health Program (AFOSH)
Training
Work Center Administration
Operator Care of Assigned Government Vehicles
Supply
Technical Orders (TO) and Technical Publications
Supervision
C-E Equipment Maintenance Management
C-E Equipment Maintenance System Inspecting, Reporting, and Forms

NOTE 3: Equipment/system knowledge and/or performance tasks are defined in the AFJQS. Training is mandatory for use in conjunction with this CTG. AFJQS items set the standard for qualification and certification for these items. ***AFTQPs listed in the CTG do not have task listings, therefore tracking through CAMS is not possible. Annotate completion of these products on AF Form 623A.

NOTE 4: Refer to the Air Force Education and Training Course Announcements (ETCA) database, formally AFCAT 36-2223, USAF Formal Schools Catalog, for information on all formal schools identified in this CTG: http://hq2af.keesler.af.mil/etca.htm.

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
1. TEST EQUIPMENT. TR: TO 33K-1-100, Applicable test equipment technical orders							
1.1. Explain the function of test equipment.	-	K					
1.2. Explain the applications of test equipment.	-	K					
1.3. Perform equipment maintenance using the following test equipment/devices:							
1.3.1. Multimeter.	X*	K					
1.3.2. Vibraground.	X*	K					
1.3.3. RF generator.	X*	K					
1.3.4. Pulse/function generator.	X*	K					
1.3.5. Oscilloscope.	X*	K					
1.3.6. Storage oscilloscope.	X*	K					
1.3.7. RF power meter.	X*	K					
1.3.8. Laser power meter.	X*	-					
1.3.9. Fiber optic power meter.	X*	-					
1.3.10. Frequency counter.	X*	K					
1.3.11. Spectrum analyzer.	X*	K					
1.3.12. Distortion analyzer.	X*	K					
1.3.13. Logic analyzer.	X*	-					
1.3.14. Protocol analyzer.	X*	-					
1.3.15. Attenuators (fixed and variable).	X*	K					
1.3.16. EbNo/Noise test set.	X*	K					
1.3.17. Bit error rate test set.	X*	K					
1.3.18. Fiber optic test set.	X*	K					
1.3.19. Noise test set.	X*	K					
1.3.20. Time domain reflectometer.	X*	K					
1.3.21. Optical time domain reflectometer (OTDR).	X*	K					
1.3.22. Waveguide couplers and adapters.	X*	K					
1.3.23. High voltage probe.	-	-					
1.3.24. Crystal detector.	X*	K					
1.3.25. SWR meter.	-	-					
1.3.26. Precision power supplies.	X*	-					
1.3.27. Chart recorders.	X*	-					
1.3.28. Bandpass filters.	X*	-					
1.3.29. Lightwave source.	-	-					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
1.3.30. Bolometer.	X*	K					
1.4. Isolate malfunctions within test equipment to cards or subassemblies.	-	-					
2. GENERIC MAINTENANCE TASKS.							
2.1. Locate elements such as unit, module, row, column, component, pin, connector, or test point using alphanumeric designator.	X	-					
2.2. Perform visual inspection of systems, cabinets, cables, and equipment.	X	-					
2.3. Replace minor electrical hardware such as lamps and fuses.	X	-					
2.4. Clean and treat filters.	X	-					
2.5. Remove and replace line replaceable unit (LRU) filters.	X*	-					
2.6. Solder and desolder electronic equipment components.	X*	-					
2.7. Perform high reliability soldering.	-	-					
2.8. Remove and replace LRU batteries.	X*	-					
2.9. Maintain or issue consolidated tool kits (CTK).	-	-					
2.10. Select proper hand/power tools.	X*	-					
2.11. Use proper hand/power tools.	X*	-					
2.12. Care for hand/power tools.	X*	-					
2.13. Comply with TCTOs.	X*	-					
3. PERFORM GENERAL MAINTENANCE.							
3.1. Perform power-up and power-down procedures.	X	-					
3.2. Interpret results of diagnostic program.	X*	-					
3.3. Interpret results of operational programs.	X*	-					
3.4. Interpret block diagram for fault isolation.	X*	-					
3.5. Interpret logic diagram for fault isolation.	X*	-					
3.6. Interpret schematic diagram for fault isolation.	X*	-					
4. 2E1X1 CAREER FIELD MISSIONS.							
4.1. Defense Satellite Communications System (DSCS)							
4.1.1. Identify the purpose, capabilities, and limitations of the DSCS.	X	K					
4.1.2. Identify the purpose of the Satellite Segment.	X*	K					
4.1.3. Identify the capabilities and limitations of the Fixed Ground Segment.	X*	K					
4.1.4. Identify the capabilities and limitations of the Tactical Ground Segment.	X*	K					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
4.2. Identify the purpose, capabilities, and limitations of the Defense Meteorological Satellite Program (DMSP).	X	K					
4.3. Defense Support Program (DSP).							
4.3.1. Identify the purpose, capabilities, and limitations of the DSP.	X	K					
4.3.2. Identify the principles, capabilities, and limitations of the Large Processing Station (LPS) – Satellite Tracking Set AN/GKC1. TR: See 31Z1-5-01, Ground Data System LOAP, for publications	X*	-					
4.3.3. Identify the principles, capabilities, and limitations of the Simplified Processing Station/Replacement (SPS/R). TR: See System Level Technical Document 146A601/58691 for publications	X*	-					
4.3.4. Identify the principles, capabilities, and limitations of the Mobile Ground Station (MGS). TR: See 31Z1-5-01, Ground Data System LOAP, for publications	X*	-					
4.4. Test Range Mission.							
4.4.1. Identify principles of the Test Range Mission. TR: TO 31-1-141-13, applicable TOs and manuals, Range Commanders Council (RCC) Document 106 (Current)	X	K					
4.4.2. Identify principles of instrumentation and telemetry systems.	X	K					
4.4.3. Identify principles of computer-based instrument control and data acquisition.	X*	-					
4.4.4. Identify principles of test range organization and function.	X*	-					
4.4.5. Identify applicable standards for instrumentation and telemetry systems.	X*	-					
4.5. Identify principles, capabilities, and limitations of MILSTAR.	X	K					
4.6. Wideband Systems.							
4.6.1. Identify principles, capabilities, and limitations of line-of-sight radio systems.	X	K					
4.6.2. Identify principles, capabilities, and limitations of Troposcatter radio systems.	X	K					
4.7. Global Positioning System /NAVSTAR Program (GPS). TR: See 31S1-2FSQ141-01, GPS LOAP, for publications							

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
4.7.1. Identify the principles, capabilities, and limitations of the Master Control Station (MCS).	X*	-					
4.7.2. Identify the principles, capabilities, and limitations of the Monitor Station.	X*	-					
4.7.3. Identify the principles, capabilities, and limitations of the Ground Antenna.	X*	-					
5. COMMON 2E1X1 PRINCIPLES.							
5.1. Identify the principles of orbital mechanics.	X	K					
5.2. Identify the principles of RF transmission theory.	X	K					
5.3. Satellite System Segments.							
5.3.1. Identify the principles, capabilities, and limitations of a Space Segment.	X	K					
5.3.2. Identify the principles, capabilities, and limitations of a Command and Control Segment.	X	K					
5.3.3. Identify the principles, capabilities, and limitations of a User Segment.	X	K					
5.4. Identify the principles of acquisition and tracking.	X	K					
5.5. Identify the principles of satellite look angle calculations.	X*	K					
5.6. Identify the principles of protecting electronic systems from effects of electromagnetic interference (EMI).	X	K					
5.7. Network Principles.							
5.7.1. Identify principles, capabilities, and limitations of network topologies (Star, Ring, Bus, etc.).	-	K					
5.7.2. Identify principles, capabilities, and limitations of network types (LAN, WAN, VPN).	-	K					
5.7.3. Identify principles, capabilities, and limitations of the following information transport devices:							
5.7.3.1. Routers.	-	K					
5.7.3.2. Hubs (Concentrators).	-	K					
5.7.3.3. Bridges.	-	K					
5.7.3.4. Gateways.	-	K					
5.7.3.5. Switches:							
5.7.3.5.1. Circuit switching.	-	K					
5.7.3.5.2. Message switching.	-	K					
5.7.3.5.3. Packet switching.	-	K					
5.7.3.5.4. Asynchronous transfer mode (ATM).	-	K					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
5.8. Identify the principles, capabilities, and limitations of the Integrated Digital Network Exchange (IDNX) TR: Applicable Commercial Manuals	X*	K					
5.9. Identify the principles, capabilities, and limitations of distribution frames.	-	-					
5.10. Computer Data/Control Busses. TR: Applicable TOs and manuals							
5.10.1. Identify characteristics of RS-232 serial buss.	-	K					
5.10.2. Identify characteristics of IEEE-488 parallel buss.	-	K					
5.10.3. Identify characteristics of MIL STD 1553 avionics buss.	-	K					
5.11. Identify the principles, capabilities, and limitations of airborne antenna systems.	X*	K					
5.12. Identify the principles, capabilities, and limitations of ground antenna systems.	X	K					
5.13. Tracking Systems. TR: Applicable TOs and manuals							
5.13.1. Identify the principles, capabilities, and limitations of the tracking feed system.	-	K					
5.13.2. Identify the principles, capabilities, and limitations of the scanner.	-	K					
5.13.3. Identify the principles, capabilities, and limitations of the tracking downconverter.	-	K					
5.13.4. Identify the principles, capabilities, and limitations of the antenna position control and indicators.	-	K					
5.13.5. Identify the principles, capabilities, and limitations of antenna drive systems.	-	K					
5.14. Identify principles, capabilities and limitations of control, monitoring, and alarm equipment.	-	K					
5.15. Transmit Systems. TR: Applicable TOs or manuals							
5.15.1. Identify the principles, capabilities, and limitations of transmit systems.	X	K					
5.15.2. Identify the principles, capabilities, and limitations of upconverters.	-	K					
5.15.3. Identify principles, capabilities, and limitations of power amplifiers (PA).	-	K					
5.16. Receive Systems. TR: Applicable TOs or manuals							
5.16.1. Identify the principles, capabilities, and limitations of receive systems.	X	K					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
5.16.2. Identify the principles, capabilities, and limitations of low noise amplifiers (LNA).	-	K					
5.16.3. Identify the principles, capabilities, and limitations of downconverters.	-	K					
5.17. Information Processing.							
5.17.1. Identify principles, capabilities, and limitations of time division multiplexers.	X	K					
5.17.2. Identify principles, capabilities, and uses of magnetic tape recorders.	X*	K					
5.17.3. Identify principles, capabilities, and uses of bit synchronizer (BIT SYNC).	-	K					
5.17.4. Identify principles, capabilities, and limitations of decomutators.	-	K					
5.17.5. Identify principles, capabilities, and limitations of modems.	X	K					
5.17.6. State general principles of fiber optic theory.	X	K					
5.17.7. Identify the principles, capabilities, and limitations of fiber optic multiplexers.	-	K					
5.17.8. Identify the principles, capabilities, and limitations of fiber optic modems.	-	K					
5.18. Timing and Frequency Standards.							
5.18.1. Identify the principles, capabilities, and limitations of timing and frequency distribution systems.	X	K					
5.18.2. Identify the principles, capabilities, and limitations of timing receivers.	X*	K					
5.18.3. Identify the principles, capabilities, and limitations of time code generator/translator.	X*	K					
6. 2E1X1 SYSTEMS AND EQUIPMENT.							
6.1. Satellite Equipment.							
6.1.1. Identify the principles, capabilities, and limitations of SHF Satellite terminals.	X*	K					
6.1.2. Identify the principles, capabilities, and limitations of UHF Satellite terminals.	X*	K					
6.1.3. Identify principles, capabilities, and limitations of EHF Satellite terminals.	X*	K					
6.2. Instrumentation and Telemetry Equipment.							
6.2.1. Identify the principles, capabilities, and limitations of instrumentation and telemetry equipment.	X	K					
6.3. Wideband Equipment.							
6.3.1. Identify the principles, capabilities, and limitations of wideband systems.	X	K					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
6.4. Cryptographic Equipment. NOTE: All personnel that load cryptographic key, perform operational checkout, change strapping options, change out on-line, or perform any level of maintenance on a cryptographic equipment item must be trained and certified according to AFI 21-109, Communications Security (COMSEC) Equipment Maintenance and Maintenance Training.							
6.4.1. Identify the principles, capabilities, and limitations of cryptographic equipment.	X*	-					
6.4.2. Load cryptographic variables.	X*	-					
6.5. Identify the principles, capabilities, and limitations of support equipment (UPS, ECU, etc.)	-	K					
6.6. GROUNDING SYSTEMS, CABLES, AND WIRING. TR: AFOSH Standards and TO 31-10-24							
6.6.1. Interpret wiring diagrams.	-	-					
6.6.2. Isolate malfunctions in cable assemblies.	-	-					
6.6.3. Remove or install equipment signal cables or wiring.	-	-					
6.6.4. Identify the importance of equipment grounding for communications systems.	X	K					
6.6.5. Remove or install equipment grounds.	X*	-					
6.6.6. Check quality of equipment grounds.	X*	-					
6.6.7. Fabricate or modify cable installations (other than fiber optic cables).	-	-					
6.6.8. Fabricate or modify fiber optic cable installations.	-	-					
7. PERFORMANCE ASSESSMENT. TR: DCACs 300-175-9, 310-70-1, and 310-70-75; MIL-STD-188-100; Applicable circuit/system standards							
7.1. Identify circuit and link performance standards.	-	-					
7.2. Perform system testing.	-	-					
7.3. Compile systems test data.	-	-					
7.4. Evaluate systems test data.	-	-					
7.5. Perform c/kt measurement.	-	-					
7.6. Monitor circuit and link quality.	-	-					
8. OPERATIONS. TR: Applicable Defense Information Systems Agency (DISA) circulars, TOs, and manuals							
8.1. Identify the principles of establishing a communications link.	-	K					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
8.2. Identify the principles of Counter-Counter Measures.	-	-					
8.3. Identify general principles of Satellite Access Request (SAR) process.	-	K					
8.4. Identify After Action Report procedures.	-	-					
8.5. Maintain station logs.	-	-					
8.6. Accomplish the following DISA report requirements: TR: DISA Circulars: 270-A85-1, 800-70-1, 310-55-1							
8.6.1. SATCOM Equipment Reports (SERS).	X*	-					
8.6.2. HAZCON reports.	X*	-					
8.6.3. Voice and data orderwire reporting.	X*	-					
9. STANDARD INSTALLATION PRACTICES. TR: AFI 33-104; 31 Series technical orders							
9.1. Install communications systems.	-	-					
9.2. Configure communications systems.	-	-					
9.3. Interconnect communications systems.	-	-					
9.4. Inspect communications systems.	-	-					
9.5. Update facility records.	-	-					
10. DEPLOYMENT PROCEDURES. Accomplish the following mobility procedures: TR: Applicable MAJCOM directives; applicable AFOSH standards; TOs 00-20-series and manuals							
10.1. Predeployment.							
10.1.1. Prepare systems and accessories for deployment.	X*	K					
10.1.2. Prepare environmental support equipment for deployment.	X*	-					
10.1.3. Prepare support equipment for deployment.	X*	-					
10.2. Employment.							
10.2.1. Prepare systems and accessories for operation at deployed location.	X*	K					
10.2.2. Prepare environmental support equipment for operation at deployed location.	X*	-					
10.2.3. Prepare support equipment for operation at deployed location.	X*	-					
10.3. Post Deployment.							
10.3.1. Recover systems and accessories after deployment.	X*	K					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
10.3.2. Recover environmental support equipment after deployment.	X*	-					
10.3.3. Recover support equipment after deployment.	X*	-					
200. AIR FORCE JOB QUALIFICATION STANDARDS APPLICABLE TO AFSC 2E151. TR: AFI 21-116, 36-2233, CFETP 2E1X1							
200.2. AFJQS 2EXXX-200B, C-E Enlisted Specialty Training. (See Notes 2 and 3)	X						
200.13. AFQTP 2EXXX-200M, Mobility Readiness Program. (See Note 3)	X*						
201.3. AFJQS 2EXXX-201C, Corrosion Prevention and Control. (See Note 3)	X						
201.5. AFJQS 2EXXX-201E, Ground C-E Core Automated Maintenance Systems (CAMS). (See Note 3)	X*						
201.7. AFJQS 2EXXX-201G, Maintenance Support. (See Note 3)	X*						
201.8. AFJQS 2EXXX-201H, Work Center Deficiency Reporting System. (See Note 3)	X*						
201.10. AFJQS 2EXXX-201J Maintenance Training Program. (See Note 3)	X*						
201.12. AFQTP 2EXXX-201L, C-E Work Center Managers Handbook. (See Note 3)	X*						
201.16. AFJQS 2EXXX-201P, Work Center Test Equipment Management. (See Note 3)	X*						
201.19. AFJQS 2E1X1-201S, Timing GPS Receiver Maintenance. (See Note 3)	X*						
201.21.1. AFJQS 2E1X1-201UA, Teletypewriter Test Set. (See Note 3)	X*						
201.22. AFJQS 2E1X1-201V, AN/FCC-100(V) Multiplexer Set. (See Note 3)	X*						
201.23. AFJQS XXXXX-201W, Integrated Digital Network Exchange (IDNX 90). (See Note 3)	X*						
201.24. AFJQS 2EXXX-201X, E & I Quality Assurance. (See Note 3)	X*						
202.1. AFQTP 2EXXX-202A, Electrostatic Discharge (ESD) Familiarization Handbook. (See Note 3)	X*						
202.2. AFJQS 2EXXX-202B, SIPT Electronics and Inside Plant (E&I). (See Note 3)	X*						
203.7. AFQTP 2E1X1-203G, Digital European Backbone (DEB) Familiarization Package. (See Note 3)	X*						
203.7.1. AFJQS 2E1X1-203GA, AN/FCC-99(V) Multiplexer Set. (See Note 3)	X*						

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
203.7.2. AFJQS 2E1X1-203GB, AN/GSQ-215(V) Frequency Control Set Maintenance. (See Note 3)	X*						
203.8. AFJQS 2E1X1-203H, AN/FRC-170/171/173 Radio Sets. (See Note 3)	X*						
203.20. AN/TRC-170 Radio Set. Supplemental Course: E3AZP2E151 000 (See Note 4.)							
203.20.1. AFJQS 2E1X1-203TA, AN/TRC-170(V2) & (V3) Mobile Tropo Radio Set. (See Note 3)	X*						
203.20.2. AFJQS 2E1X1-203TB, TER-170 Tropo Satellite Support Radio. (See Note 3)	X*						
203.20.3. AFJQS 2E1X1-203TC, AN/GRC-239, Tropo Satellite Support Radio. (See Note 3)	X*						
203.21. AFJQS 2E1X1-203U, AN/TSC-129 Hammer Rick Satellite Transceiver System. (See Note 3)	X*						
203.22. AFJQS 2E1X1-203V, AN/PSC-5 Spitfire. (See Note 3)	X*						
203.23. AFJQS 2E1X1-203W, AN/TSQ-146 Multiplexer Van. (See Note 3)	X*						
204.12.3. AFJQS 2E1X1-204LC, LORAIN 48V Power Supply PP-7694/U thru PP-7701/U Maintenance. (See Note 3)	X*						
204.14. AFJQS 2EXXX-204N, AN/WSC-3(V)9 Satellite Communications Set. (See Note 3)	X*						
204.22. AFJQS 2E1X1-204V, AN/FCC-100(V)7 Multiplexer Set. (See Note 3)	X*						
205.1. AFJQS 2E1X1-205A, AN/TSC-152 Lightweight Multi-band Satellite Terminal (Trailer). (See Note 3)	X*						
205.2. AFJQS 2E1X1-205B, AN/USC-59 Lightweight Multi-band Satellite Terminal (Transit Case). (See Note 3)	X*						
206.25. AFJQS 2EXXX-206Y, AN/GSC-42(V) AFSATCOM Terminal. (See Note 3)	X*						
207.13. AFJQS 2E1X1-207M, AN/GSC-49 Satellite Terminal. (See Note 3)	X*						
207.14. Ground Mobile Forces (GMF) Satellite Terminals. Supplemental Course: E3AZP2E151 001 (See Note 4)							
207.14.1. AFQTP 2E1X1-207NA, GMF Satellite Terminal Familiarization. (See Note 3)	X*						
207.14.2. AFJQS 2E1X1-207NB, AN/TSC-94A(V)1/2 & AN/TSC-100(V)1/2 Ground Mobile Forces Satellite Communications Terminal. (See Note 3)	X*						
207.14.3. AFJQS 2E1X1-207NC, AN/TSC-85B(V)2 & AN/TSC-93B(V)2 NABS Terminals. (See Note 3)	X*						

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	5-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
207.19.1. AFQTP 2E1X1-207SA, Defense Communications Subsystem (DCSS) Functional Analysis. (See Note 3)	X*						
207.19.2. AFJQS 2E1X1-207SB, AN/USC-28(V) Satellite Communications Set. (See Note 3) Supplemental Course: E5AZA2E151 039 (See Note 4)	X*						
207.19.4. AFJQS 2E1X1-207SD, AN/GSC-24 Multiplexer Set. (See Note 3) Supplemental Course: E5AZA2E151 016 (See Note 4)	X*						
207.19.6. AFJQS 2E1X1-207SF, DCSS/GMF Gateway. (See Note 3)	X*						
207.21. AFJQS 2E1X1-207U, AN/TSC-88 Communications Terminal. (See Note 3)	X*						
208.3. AFJQS 2E1X1-208C, AN/GSC-44 AFSATCOM Terminal. (See Note 3)	X*						
208.5. AFJQS 2E1X1-208E, AN/FRC-175 Peace Keeper AFSATCOM System. (See Note 3)	X*						
208.6. AFJQS 2E1X1-208F, AN/FRC-175 Minuteman AFSATCOM System. (See Note 3)	X*						
208.7. AFJQS 2E1X1-208G, AN/FCC-98(V)1 and (V)1X Multiplexer Sets. (See Note 3)	X*						
208.25. AFJQS 2EXXX-208Y, UXC-7 Lightweight Tactical Facsimile. (See Note 3)	X*						
209.2. AFJQS 2E1X1-209B, DCS Voice Orderwire. (See Note 3)	X*						
209.5.4. AFJQS 2EXXX-209ED, Air Force Mission Support System (AFMSS). (See Note 3)	X*						
210.23. AFQTP 2E1X3-210W, Base Land Mobile Radio Management. (See Note 3)	X*						
215.6. AFJQS 2E1X1-215F, AN/FSC-97 Single Channel Transponder Injection System (SCTIS). (See Note 3)	X*						
215.10. AFJQS 2E1X1-215J, AN/GSC-52 Medium Satellite Communications Terminal. (See Note 3) Supplemental Course: E3AZA2E151 051 (See Note 4)	X*						
215.13. AFJQS 2E1X1-215M, AN/FSC-111 ICBM SHF Satellite Terminal (ISST). (See Note 3)	X*						
215.14. AFJQS 2E1X1-215N, AN/FRC-181 (V)1,2,3 MILSTAR Terminals. (See Note 3) Supplemental Course: E3AZP2E151 007 (See Note 4)	X*						

BEHAVIORAL FORMAT CTG CODING SYSTEM

Each CTG element is written as a behavioral statement. The detail of the statement and verb selection reflects the level of training provided.

Code	Definition
K	Subject Knowledge Training - The verb selection identifies the individual's ability to identify facts, state principles, analyze, or evaluate the subject.
P	Performance Training - Identifies the individual performed the task to the satisfaction of the course; however he/she may not be capable of meeting the field requirements for speed and accuracy.
pk	Performance Knowledge Training - The verb selection identifies the individual's ability to relate simple facts, procedures, operating principles, and operational theory for the task.
-	When this code is used in the OJT Upgrade Column it indicates that the certification or qualification on this task is a local determination..
X	When this code is used in the OJT Upgrade Column it indicates that the individual must be trained and certified on this task before they can be upgraded to the appropriate skill level
X*	When this code is used in the OJT Upgrade Column it indicates that the individual must be trained and certified on this task before they can be upgraded to the appropriate skill level if the assigned duty position is responsible to maintain the equipment or system indicated as assigned by the local workcenter supervisor. This code indicates that training to satisfy this requirement is normally provided through OJT.

The identification blocks listed below are to be used when the trainer is other than the trainee's immediate supervisor.

THIS BLOCK IS FOR IDENTIFICATION PURPOSES ONLY		
NAME OF TRAINEE		
PRINTED NAME *(Last, First, Middle Initial)*	INITIALS *(Written)*	SSAN
PRINTED NAME OF CERTIFYING OFFICIAL AND WRITTEN INITIALS		
N/I	N/I	
N/I	N/I	
N/I	N/I	

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	7-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
70. MILSATCOM AND COMMERCIAL SATELLITE COMMUNICATIONS. TR: CJCSI 6250.01							
70.1. Describe MILSATCOM and commercial satellites communications infrastructure and levels of responsibility.	X						
71. GENERAL CONCEPTS.							
71.1. Explain the principles, capabilities, and limitations of the following types of satellites: TR: DISAC 800-70-1, Vol 1, Sup 2							
71.1.1. DSCS.	X						
71.1.2. MILSTAR.	X						
71.1.3. UFO.	X						
71.1.4. Commercial C and Ku band.	X						
71.1.5. Commercial L band.	X						
71.2. Principles of Spectrum Interference. TR: AFI 10-707							
71.2.1. Explain different types of interference.	X						
71.2.2. Identification methods.	X						
71.2.3. Countermeasures.	X						
71.2.4. Reporting.	X						
72. DEPLOYMENT CONCEPTS.							
72.1. Explain the capabilities, limitations, and integration of the following types of deployable systems: TR: AFIs 10-403, 25-101, and AFMAN 23-110							
72.1.1. Satellite Systems and Equipment. TR: Applicable Technical Manuals or DISA Circular							
72.1.1.1. DSCS.	X*						
72.1.1.2. MILSTAR.	X*						
72.1.1.3. UFO.	X*						
72.1.1.4. Commercial C and Ku band systems.	X*						
72.1.1.5. Commercial L band systems.	X*						
72.1.2. Terrestrial systems and equipment.							
72.1.2.1. Troposcatter.	X*						
72.1.2.2. Fixed microwave.	X*						
72.1.2.3. Tactical microwave.	X*						
72.2. Explain the interrelationship between the following: TR: JCS Pub 6.05							

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	7-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
72.2.1. Site configurations.	X*						
72.2.2. Internal and external connectivity.	X*						
72.3. Accomplish the following site engineering tasks: TR: None							
72.3.1. Path profile.	X*						
72.3.2. Siting of equipment.	X*						
72.3.3. Satellite access.	X*						
72.3.4. Equipment grounding.	X*						
72.3.5. Develop crew assignment sheets.	X*						
72.4. Accomplish the following mobility procedures: TR: Applicable MAJCOM directives; TOs 00-20-series							
72.4.1. Unit Type Code (UTC) structure.	X*						
72.4.2. Air mobility.	X*						
72.4.3. Road mobility.	X*						
72.4.4. Pre-deployment inspections.	X*						
72.4.5. Post-deployment turn around.	X*						
72.4.6. Field operations.	X*						
73. SYSTEMS CONCEPTS.							
73.1. Explain the functions of the following satellite and communication systems:							
73.1.1. DEB.	-						
73.1.2. DSCS (STEP, Gateway, Reachback, JRSC).	-						
73.1.4. MILSTAR.	-						
73.1.5. TDC.	-						
73.1.6. DISN.	-						
73.1.7. Global Command and Control System (GCCS).	-						
73.1.8. Commercial SATCOM.	-						
73.1.9. AFSATCOM.	-						
73.1.10. Single Channel UHF.	-						
73.2. Explain the function of the following control systems: TR: DISAC 800-70-1, 310-70-1							
73.2.1. Interim Tactical Orderwire System (ITOS).	-						
73.2.2. DFCS-FDMA.	-						
73.2.3. DECS-ECCM.	-	-					

TASKS, KNOWLEDGE AND TECHNICAL REFERENCES	7-LEVEL		OJT CERTIFICATION				
	OJT Upgrade	CDC	Start Date	Stop Date	Trainee Initials	Trainer Initials	Certifier Initials
73.3. System Control and Reporting. TR: DISAC 310-70-1							
73.3.1 Explain the DISA system hierarchy	X						
73.3.2. Explain DISA reporting procedures.	X						
73.3.3. Explain circuit activation procedures	X						

Section B - Course Objective List

4. This section not used.

Section C - Support Materials

5. This section not used.

Section D - Training Course Index

6. Refer to the Air Force Education and Training Course Announcements (ETCA) database, formally AFCAT 36-2223, USAF Formal Schools Catalog, for information on all formal schools identified in this CTG: http://hq2af.keesler.af.mil/etca.htm.

6.1. **Air Force In-Residence Courses**

Course Number	Course Title	Location
E3AZP2E151 007	MILSTAR Organizational Level Maintenance	Ft Gordon
E3AZP2E151 001	Tactical Satellite Communications O/I Maintenance	Ft Gordon
E3AZP2E151 000	AN/TRC-170 O/I Maintenance	Ft Gordon
E5AZA2E151 016	DCSS Refresher	Ft Gordon
E3AZA2E151 060	SMART-T Terminal Operator/Maintainer	Ft Gordon
E5AZA2E151 039	Satellite communications Set AN/USC-28(v)	Ft Gordon
E5AZA2E151 051	AN/GSC-52, O/I Maintenance	Ft Gordon

6.2. **Air Force Job Qualification Standards and Air Force Qualification Training Packages**

6.2.1. Refer to AFIND8, Numerical Index of Specialty Education/Training Publications for the list of published AFJQS/AFQTPs and how to order these publications. Refer to AFI 36-2233, Air Force On-The-Job Training Products for Communications-Electronics Enlisted Specialty Training for information on all Air Force Job Qualification Standards/Air Force Qualification Training Packages.

6.2.2. AFJQS/AFQTPs applicable to AFSC 2E1X1:

Publication No.	Pseudo Code	Publication Title
AFJQS 2E1X1-201S	2EXXX-201.19	Timing GPS Receiver Maintenance
AFJQS 2EXXX-201UA	2EXXX-201.21.1	AN/GGM-21 Teletypewriter Test Set
AFJQS 2EXXX-201V	2EXXX-201.22	AN/FCC-100 (V) Multiplexer Set
AFQTP 2E1X1-203G	2E1X1-203.7	Digital European Backbone (DEB) Familiarization Package
AFJQS 2E1X1-203GA	2E1X1-203.7.1	AN/FCC-99(V) Multiplexer Set
AFJQS 2E1X1-203GB	2E1X1-203.72	AN/GSQ-215(V) Frequency Control Set Maintenance
AFJQS 2E1X1-203H	2E1X1-203.8	AN/FRC-170/171/173 Radio Sets
AFJQS 2E1X1-203TA	2E1X1-20320.1	AN/TRC-170 (V2) & (V3) Mobile Tropo Radio Set
AFQJS 2E1X1-203TB	2E1X1-203.20.2	TER-170 Tropo Satellite Support Radio
AFJQS 2E1X1-203TC	2E1X1-203.20.3	AN/GRC-239 Tropo Satellite Support Radio
AFJQS 2E1X1-203U	2E1X1-203.21	AN/TSC-129 Hammer Rick Satellite System
AFJQS 2E1X1-203V	2E1X1-203.22	AN/PSC-5 Spitfire
AFJQS 2E1X1-203W	2E1X1-203.23	AN/TSQ-146 Multiplexer Van
AFJQS 2E1X1-204LC	2E1X1-204.12.3	Lorain 48V Power Supply (PP-7694/U Thru PP-7701/U) Maintenance
AFJQS 2EXXX-204N	2EXXX-204.14	AN/WSC-3 (V)9 Satellite Communications Set
AFJQS 2E1X1-204V	2E1X1-204.22	AN/FCC-100 (V)7 Multiplexer Set
AFJQS 2E1X1-205A	2E1X1-205.1	AN/TSC-152 Lightweight Multi-band Satellite Terminal (Trailer)

Publication No.	Pseudo Code	Publication Title
AFJQS 2E1X1-205B	2E1X1-205.2	AN/USC-59 Lightweight Multi-band Satellite Terminal (Transit Case)
AFJQS 2EXXX-206Y	2EXXX-206.25	AN/GSC-42(V) AFSATCOM Terminal
AFJQS 2EX1-207M	2EX1-207.13	AN/GSC-49 Satellite Terminal
AFJQS 2E1X1-207NA	2E1X1-207.14.1	Ground Mobile Forces Satellite Terminal Familiarization
AFJQS 2E1X1-207NB	2E1X1-207.14.2	AN/TSC-94A (V)1/2 & AN/TSC-100A (V)1/2 Ground Mobile Forces Satellite Communications Terminal
AFJQS 2E1X1-207NC	2E1X1-207.14.3	AN/TSC-85B (V)2 & AN/TSC-93B NABS Terminals
AFJQS 2E1X1-207SA	2E1X1-207.19.1	Defense Communications Subsystem (DCSS) Functional Analysis
AFJQS 2E1X1-207SB	2E1X1-207.19.2	AN/USC-28(V) Satellite Communications Set
AFJQS 2E1X1-207SD	2E1X1-207.19.4	AN/GSC-24 Multiplexer Set
AFJQS 2E1X1-207SF	2E1X1-207.19.6	DCSS/GMF Gateway
AFJQS 2E1X1-207U	304X6-207.21	AN/TSC-88 Communications Terminal
AFJQS 2E1X1-208C	2E1X1-208.3	AN/GSC-44 Communications Terminal
AFJQS 2E1X1-208E	2E1X1-208.5	AN/FRC-175 Peace Keeper AFSATCOM System
AFJQS 2E1X1-208F	2E1X1-208.6	AN/FRC-175 Minuteman AFSATCOM System
AFJQS 2E1X1-208G	2E1X1-208.7	AN/FCC-98(V)1 and (V)1X Multiplexer Sets
AFJQS 2E1X1-209B	2E1X1-209.2	Defense Communication System (DCS) Orderwire
AFJQS 2E1X1-215F	2E1X1-215.6	AN/FSC-97 Single Channel Transponder Injection System(SCTIS)
AFJQS 2E1X1-215J	2E1X1-215.10	AN/GSC-52 Medium Satellite Communications Terminal
AFJQS 2E1X1-215M	2E1X1-215.13	AN/FSC-111 ICBM SHF Satellite Communications Terminal (ISST)
AFJQS 2E1X1-215N	2E1X1-215.14	AN/FRC-181 (V)1,2,3 MILSTAR Terminals

6.2.2. Additional AFJQS/AFQTP maintenance management and generic training products applicable to this specialty.

Publication No.	Pseudo Code	Publication Title
AFJQS 2EXXX-200B	2EXXX-200.2	2EXXX C-E Enlisted Specialty Training
AFQTP 2EXXX-200M	2EXXX-200.13	Mobility Readiness Program
AFJQS 2EXXX-201C	2EXXX-201.3	Corrosion Control
AFJQS 2EXXX-201E	2EXXX-201.5	Ground C-E Core Automated Maintenance System (CAMS)
AFJQS 2EXXX-201G	2EXXX-201.7	Maintenance Support
AFJQS 2EXXX-201H	2EXXX-201.8	Work Center Deficiency Reporting System
AFJQS 2EXXX-201J	2EXXX-201.10	Maintenance Training Program
AFQTP 2EXXX-201L	2EXXX-201.12	Work Center Managers Handbook
AFQTP 2EXXX-201LB	2EXXX-201.12.2	Communications Electronic (C-E) Manager's Handbook
AFJQS 2EXXX-201P	2EXXX-201.16	Work Center Test Equipment Management
AFJQS 2EXXX-201W	2EXXX-201.23	Integrated Digital Network Exchange (IDNX 90)
AFJQS 2EXXX-201X	2EXXX-201.24	E&I Quality Assurance
AFQTP 2EXXX-202A	2EXXX-202.1	Electrostatic Discharge (ESD) Familiarization Handbook
AFJQS 2EXXX-202B	2EXXX-202.2	SIPT Electronics and Inside Plant (E&I)
AFJQS 2EXXX-208Y	2EXXX-208.25	UXC-7 Lightweight Tactical Facsimile
AFJQS 2EXXX-209ED	2EXXX-209.5.4	Air Force Mission Support System (AFMSS)
AFQTP 2E1X3-210W	2E1X3-210.23	Base Land Mobile Radio Management

6.3. **Air Force Engineering Technical Services (AFETS) Training**

6.3.1. See the current edition of the *Catalog of Communications-Electronics Air Force Engineering and Technical Services Courses* (This catalog is revised annually and is available through your MAJCOM's C-E MATAG Working Group representative.) Space Systems equipment training is available from AFETS/CFS/SMT personnel through the listed MAJCOMs.

6.3.2. Available AFETS training.

EQUIPMENT	MAJCOM			
	ACC	AFSPC	PACAF	USAFE
AN/FCC-98, Multiplexer Set		X	X	X
AN/FCC-99, Multiplexer Set				X
AN/FCC-100, Multiplexer Set		X		X
AN/FCC-112, Digital Patch and Access System				X
AN/FRC-171, Microwave Radio Set				X
AN/FRC-17X, Radio Set				X
AN/FSC-78, System Familiarization		X	X	
AN/GRC-239, TROPO/Satellite Support Radio (TSSR)	X		X	X
AN/GSC-24, Multiplexer Set		X	X	
AN/GSC-51, DFCS		X	X	X
AN/GSC-52, Medium Satellite Communications Terminal		X		X
AN/GSC-63, DECS			X	
AN/GSQ-215, Timing & Sync				X
AN/MSC-64, Satellite Communications Set				X
AN/USC-28		X		
AN/USC-38, Spread Spectrum Modem			X	
AN/TRC-170	X		X	
AN/TSC-94A/100A, SATCOM Familiarization	X		X	X
AN/TSC-146, Multiplexer				X
DATALOK-10, Alarm Monitor System				X
DCS O/W, DCS Orderwire				X
DMX A-3, Multiplexer Set				X
FX-4400/FX-8800, FiberMux/Modems-Analog/FiberOptic				X
LORAIN, Uninterruptable Power Supply				X
MILSTAR		X		
PP-769X, 7700, Power Supply (DEB Rectifier and Power Distribution				X
RD-U4, Radio Set (Cross English Channel)				X
TD-1234, Remote Multiplexer Combiner (RMC)			X	X
TRAMCOM, Transmission Control & Monitoring System				X
TRI-TAC, Digital Group Multiplex Equipment			X	X
TRI-TAC, Interface Course			X	
ZETACON, Alarm & Control System				X

Section E - MAJCOM Unique Requirements

7. This section not used.